6B06122 "INFORMATICS" MODULAR EDUCATIONAL PROGRAM

Semey, 2020

Summary of the educational program

1. Explanatory note

Modular educational program (MBDOU) " state mandatory standard of higher education of the Republic of Kazakhstan. Bachelor course. Rules for the organization of the educational process on credit technology of education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152 (with amendments and additions dated 01/28/2016). The standard curriculum of the educational program b3l3m "Informatics", approved by the order of the Ministry of Education and Science of the Republic of Kazakhstan No. 425 dated 08/05/2016, "Regulations on the formation of the learning trajectory students" dated 01.04/2012, form No. 26 "structure of the OU".

The GP block includes disciplines of the mandatory component (GC), which is 45 credits; and elective components (TC), which are 67 credits. Modules of these disciplines allow you to form a complex of basic (research), subject and special competencies of a graduate.

The KP block includes the disciplines of the compulsory component (GC), which is 18 credits; and the elective component (TC), which is 42 credits. Modules of these disciplines allow you to form a complex of basic and special (developing, creative, organizational and methodological) competencies of a graduate.

Practice - 8 credits;

The final state certification is 12 credits.

The student must master 240 credits (100%) upon full completion of the modular educational program. A total of 18 modules have been compiled according to the modular educational program.

The purpose and objectives of the modular educational program

- The goal is to train highly qualified specialists in the field of IT technologies with higher education, who know the basics of modern mathematical methods, methods of applied mathematics and computer science to solve problems of science, education, technology, economics, management, etc., who have practical skills and leadership qualities that meet modern requirements for the quality of specialists with higher education.

- Tasks:

- - Provision of educational services for the development of professional skills;

- - Formation of basic professional competencies of future bachelors in the specialty "Computer Science"";

- - Possibility of multi-level training;

- - Acquisition of skills in working with scientific and technical literature, the use of domestic and foreign experience in professional activities, systematization and generalization of the information received;

- - To teach to analyze and process the results obtained; to analyze the state and dynamics of objects of activity in the development of theoretical models that allow predicting the properties and behavior of objects of activity.

- 1. the graduate's competence model
- Competencies that should be inherent in the graduate after mastering the modular educational program:
Competence in the field of language:
Must know:
- - basic definitions in the field of language that contribute to the formation of a highly educated person with a broad outlook and culture of speech;
- - scientific vocabulary and scientific constructions of technical profile;
- - rules for publishing texts of different genres;
- - speech standards of the field of maintenance;
- - fundamentals of business communication.
Be able to::
- - conduct a free conversation on various topics;
- - use of reference literature in Kazakh, Russian and English (explanatory dictionaries, reference books, encyclopedias, including special terminology
Skill:
- - competent interpretation in the state, Russian and English languages;
- - competent preparation of current documentation in the state, Russian and foreign languages;
- - building a constructive dialogue;
Russian and English languages - - express your opinion in Kazakh, Russian and English from the point of view of a future specialist in the field of professional activity
- - trilingual education that contributes to the formation of the linguistic competence of future specialists in the field of information technology
- Competencies of natural sciences:
Must know:
- - basic definitions in the field of natural sciences.;
- - Basic concepts of higher mathematics and their applications in various fields;
- fundamental concepts, laws and theories of classical and modern mathematics, methods and methods for solving specific problems;
- mathematical methods, mathematical intuitions, mathematical culture;
- the essence of the basic concepts, laws, theories of classical and modern physics, their internal relationship and integrity,

the concept of physical laws, the limits of their applicability, allowing them to be effectively applied in specific situations.
Be able to::
- build mathematical models, set mathematical problems, choose suitable mathematical methods and algorithms for solving problems, use numerical methods using modern computational methods to solve problems;

- Conducting qualitative mathematical research based on mathematical analysis;
- solving generalized typical problems of the discipline from different areas of physics (theoretical and experimental-practical training tasks);
- solving professional tasks;
- simulation of physical situations using a computer;

- using methods of analysis and evaluation of experimental results.
Skill:
- solving professional tasks;
- assessment of the level of reliability of the results obtained using experimental or theoretical research methods;
- conducting a physical experiment;
- using the achievements of fundamental science for the successful study of general theoretical and special technical disciplines, the development of mathematical thinking and logic.
Social and ethical competencies:
Must know:
- socio-ethical values based on public opinion, traditions, customs, social norms and their orientation in professional activity;
- Traditions and culture of the peoples of Kazakhstan;
- Fundamentals of the legal system and legislation of Kazakhstan;
- trends in the social development of society;
Be able to::
- compliance with the norms of business ethics, possession of ethical and legal norms of behavior;
- °adequate orientation in various social situations;
- find compromises, compare your opinion with the opinion of the team;
Skill:
- tolerance to the traditions and culture of other peoples of the world;
- work in a team, defend your point of view correctly, offer new solutions;
- striving for professional and personal growth.
Information and communication competencies:
Must know:
- principles of building a modern operating system and system software;
-basic models, methods and tools used in computer systems to automate the solution of intellectual tasks;
- theoretical and practical problems of computational informatics as a field of knowledge and practical human activity related to the need for information analysis;

- Trends in the development of microelectronics, promising circuit solutions in the field of digital and analog technology;
- About the current state and trends in the development of computer architecture, computer systems, complexes and networks;
- about the architecture and capabilities of microprocessor tools;
- about the problems and directions of development of programming technologies, about the main methods and means of design automation
- about software, about methods of organizing work in software development teams.
Be able to::
- identify problems of a technical, logical nature when analyzing specific situations for programming, suggest ways to solve them and evaluate the expected results;
- systematization and generalization of information, preparation of references and reviews on professional activities, editing, referencing, reviewing texts; application of basic and special methods of information analysis in the field of professional activity; development and justification of effective solutions;

- critical assessment of trends in the development of objects in the field of professional activity from different sides (production, motivational, institutional, etc.); the use of knowledge gained in the study of mathematics, physics;
- planning and conducting research, analysis and interpretation of the data obtained;
- analysis, programming, design and operation of software and hardware complexes and protection systems;
- the use of modern technical means necessary for engineering practice.
Skill:
- special technical terminology and vocabulary of the specialty, skills of independent development of new knowledge using modern educational technologies;
- professional arguments in the analysis of standard situations in the field of upcoming activities;
- technical documentation and work with literature for solving problems of computer technology and telecommunications;
- methods of mathematical, simulation and computer modeling of devices and processes of computer technology;
- organization of individual stages of the process of developing objects of professional activity
Professional competencies:
Must know:
- structural features, organizational and practical implementation of algorithms; knowledge of the basics and prospects for the development of new technologies;
- Basic concepts and definitions of network theory;
- modern data processing technologies;
- Analysis and regulation of DBMS performance
- Ensuring the smooth operation of the SMS
- performing operations on vectors and implementing the coordinate method;

- fundamentals of the organization and functioning of the Internet connection;
- sample classes and methods for modeling complex systems;
- principles of information protection;
Be able to::
- create various programs using fundamental computational algorithms;
- system analysis, design, coding, debugging and testing, software product release;
- classification of tool packages by type;
- Creation and formatting of HTML files;
- configuring the security features installed in the operating system;
- sample classes and methods for modeling complex systems;
- using VBA language tools for programming office documents;
- timely upgrade and replacement of software versions;
- Organization of LAN design, installation and maintenance;
Skill:
- installation of operating systems;
- Information systems security audit;

- methods of designing interface components;
- construction of parallel analogs of computational algorithms;
- a web page creation tool;
- practical implementation of the artificial intelligence system;
- Programming in the Flash Professional environment, methods and means of creating modern multimedia products;
- ensuring the information security of the Organization
- Analysis of software requirements and coordination of the development of technical specifications

Special competencies:

Must know:

- Fundamentals of computer construction and architecture;
- principles of building modern operating systems and features of their application;
- technology for the development of algorithms and programs, methods for setting up and solving computer problems in various modes;
- basic principles of object-oriented programming;
- fundamentals of the organization of information processes;
- current trends in the development of graphics and design;
- hierarchical, network and relational databases;
- basic approaches, concepts related to object-oriented software design; basic principles of the Internet;

- basic concepts of computer science education, programs and textbooks developed on their basis

- Be able to::
- setting up specific configurations of operating systems;
- application of modern methods of object-oriented programming when coding software systems of various levels of complexity;
- application of system analysis in setting tasks and algorithmization of an information system, definition of a conceptual model of information systems;
- use basic visual techniques and materials; use computer graphics tools in the process of design design;
- designing a BP model using case tools;
- development of the structure and design of a web page.

Skill:

- work with various operating systems and their administration;
- Work in the algorithmization and programming environment;

-system analysis in the formulation and formalization of information system tasks, definition of the conceptual model of information systems;

- work with raster, two-dimensional and three-dimensional vector graphics software;
- development of a database for solving economic, scientific and technical problems;

-work with tools for processing and debugging client and server clocks of Internet applications.

The sequence of mastering the disciplines of social and professional interaction

Well	Disciplines that provide	Competencies	Expected Result
General education disciplines			
Required Component			
1	**Modern history of Kazakhstan**	**Socio-ethical competencies**	**Know:**social and ethical values based on public opinion, traditions, customs, social norms and focus on them in their professional activities; know the traditions and culture of the peoples of modern Kazakhstan. **Be able to:**coordinate the theoretical, specifically - historical, source study and historiographical aspects of the study of the history of Kazakhstan. **Skill:**analytical and axiological analysis in the study of complex historical processes, phenomena and historical figures of modern Kazakhstan.
1	**Information and Communication Technologies (in English)**	**Information and communication competencies**	**Know:**what economic and political factors contributed to the development of information and communication technologies; features of various operating systems; **Be able to:**determine the main trends in the field of information and communication technologies; use information resources to search and store information; working with spreadsheets, grouping data, creating graphs; application of methods and means of information protection; design and Creation simple websites; conducting processing vector Andraster images; Creation multimedia presentations; usage variousplatforms For communication; calculation And grade indicators performance supercomputers; usage various forms electronic learning Forexpanding professional knowledge; use of various cloud services. Skills: database structure development; designing and creating presentations; receiving data from the server; creating video files; work with Smart-applications; work with services on the e-government website.
1.2	**Foreign language**	**Competencies in the field of language**	**Know:**basic definitions in the field of the English language, contributing to the formation of a highly educated personality with a broad outlook and a culture of speech;

			scientific vocabulary and scientific structures of a technical profile in English; rules for depicting texts of various genres; speech norms of the sphere of technical activity; basics of business communication. **Be able to:**conduct a free conversation on various topics; use reference literature in English; express their opinion from the point of view of a future specialist in the field of professional activity. use of reference literature in English (explanatory dictionaries, reference books, encyclopedias)); **Skills:**competent interpretation in English; competent compilation of the current doomdocumentation on Kazakh English language lining up constructive dialogue; expressing one's opinion in English from the point of view of a future specialist in the field of professional activity.
1.2	**Kazakh (Russian) language**	**Competencies in the field of language**	**Know:**basic definitions that contribute to the formation of a highly educated personality with a broad outlook and a culture of speech in the field of the Kazakh (Russian) language; scientific vocabulary and scientific constructions of a technical profile in the Kazakh (Russian) language; rules for depicting texts of various genres; norms of speech in the field of technical activity; basics of business communication. **Be able to**: - conduct a free conversation on various topics; - use reference literature in the Kazakh (Russian) language; - Express your opinion from the point of view of a future specialist in the field of professional activity. **Skills:**competent interpretation in Kazakh (Russian) language; competent preparation of current documentation in the Kazakh (Russian) language; building a constructive dialogue; expressing one's opinion in the Kazakh (Russian) language with point of view of the future specialist in the field of professional activity.
2	**Philosophy**	**Socio-ethical competencies**	**Know:**the main directions, problems, theories and methods of philosophy, the content of modern philosophical discussions on the problems of socio-philological development. **Be able to:**formulate and reasonably defend their position on various issues of philosophy; apply the provisions and categories of philosophy to evaluate and analyze various social processes, facts and phenomena. **Skills:**public speaking, argumentation, discussion and controversy, crown analysis of the logic of various thoughts; written reasoned presentation of their point of view, critical perception of information.
	Political Science /	**Social**	**Know:**the main content of the course "political science"; * mastery of fundamental

	Sociology / Culturology / Psychology	**ethical competencies**	knowledge of political theory; * the range of achievements of historical thought in the field of studying ancient culture. **Be able to:**- independently work with literature of a general humanitarian nature, find key worldview problems and solve them; - think logically, systematically and critically; - to use the luggage of philosophical erudition acquired for the formation and argumentation of one's own judgments on various everyday issues. **Skill:**general education.
			Know:- laws of development and functioning of society; - features of the analysis of the modern system of social inequality, social mobility and stratification; **Be able to**: to use basic knowledge in the field of humanitarian and economic sciences in cognitive and professional activities; **Skill:**practical skill of using the knowledge gained in the analysis of specific social situations.
			Know:the structure and composition of modern cultural education; cultural studies and philosophy of culture; sociology of culture, cultural anthropology; cultural studies and cultural history; **Be able to:**to distinguish between the basic concepts of cultural studies: the dynamics of culture, symbols of language and culture, cultural codes, intercultural communication, cultural values and norms, cultural traditions, cultural picture of the world, institutions of social culture **Skill**: practical skill of using knowledge in the analysis of specific social situations.
			Know:the essence of the basic psychological processes and properties, mental states that ensure human life; be able to apply in the practice of activity the main methods of psychology and taking into account their economic specifics; psychological theories of personality, group and collective. **Be able to**: - use the acquired knowledge of psychology in their practical activities; - organize individual and group activities of people, taking into account their psychological characteristics and compatibility; - competently use communicative competence in the course of group joint activities. **Skill:**develop memory, thinking, analyze and generalize

Selectable Component			
2	**Fundamentals of market economy and entrepreneurship**	**Competence of general education**	**Know**: - the main patterns of interaction between nature and society; - fundamentals of functioning of ecosystems and development of the biosphere; - the impact of harmful and dangerous factors of production and the environment on human health; - concept, strategy, problems of sustainable development and practical ways to solve them at the global, regional and local levels; - principles of organization of safe production processes. **Be able to**: evaluate the ecological state of the natural environment; assess the technogenic impact of production on the environment; critically comprehend the trends in the development of ecological and economic systems associated with the use of natural resources, and characterize their environmental consequences. **Skills**: study of the components of the ecosystem and the biosphere as a whole; determination of optimal conditions for sustainable development of ecological systems; conducting logical discussions on topics related to the solution of environmental problems; search and systematization of standard methods of environmental monitoring; scientific and special literature.
2	**Fundamentals of law and anti-corruption culture**	**Socio-ethical competencies**	**Know:**the essence of corruption and the causes of its occurrence, the measure of moral and legal responsibility for corruption offenses. **Be able to**: to possess the skills of obtaining new knowledge about the anti-corruption culture - a holistic interdisciplinary system of knowledge. **Skill:**general knowledge
2	**Security basicsvital activity**		**Know:**the science of comfortable and safe human interaction with the technosphere is a field of scientific knowledge that develops ways to protect against them in any conditions that pose a danger to humans and inhabiting humans. **Be able to:**identify risks and quantify negative environmental impacts; predicting the development of these side effects; and assessment of the consequences of their impact; elimination of negative consequences of exposure to dangerous and harmful factors. **Skills**: socio-ethical
Basic disciplines			
Required Component			
2	**Professional**	**Competence in**	**Know:**scientific vocabulary of a technical profile and scientific structures; rules

	Kazakh (Russian) language	**language areas**	images of texts of various genres; language norms in the field of technical activity; basics of business communication. **Be able to:**choose language means, build statements taking into account literary norms and the communicative situation; distinguish between the logical and compositional structure of a scientific test, master oral public statements (message, dMKlad), analyze listened public speeches; communicate professionally; use dictionaries and correctly interpret the information received from them about language units; extract the read or listened text from the educational, professional, socio-cultural spheres, indicating the necessary information and presenting it in a certain sequence. **Skills:**work with scientific and technical literature; independent search for scientific and technical information as the basis of professional activity; listening to and fully understanding the declared information at a normal pace with the subsequent transmission of its content; conducting dialogues of interviews, surveys and conversations.
2	**Professionally oriented foreign language**	**Competence in the field of language**	**Know:**functional features of oral and written texts of a scientific and technical nature in the specialty; requirements for registration of admission in professional communication; strategy of communicative behavior in the conditions of professional communication. **Be able to:** -understand oral speech within the framework of a professional topic; - provide clarifications when discussing topics related to the profession; - independently prepare and compose oral reports on professional topics using multimedia technologies; - obtain the necessary information from other language sources created in various sign systems (text, table, graph, diagram, audiovisual series, etc.); - annotate, abstract and present in the native language the main content of the literature on the specialty, if necessary; writing messages, articles, abstracts, abstracts on professional topics. **Skill:**own the basic grammatical constructions characteristic of oral and written professionally oriented communication;
1	**Mathematics 1.2**	**Competences of natural sciences**	**Know:**basic fundamental concepts of mathematics; circuit theory; theory of continuous functions; Landau symbol, differential calculation of functions of one real variables, basic formulas and theorems of integral calculus, integrals of the first and second kind: **Be able to:**- find specific faces of numerical sets; - research

			similarity sequence; - explore the presence of a limit at a point, continuity at a point and a set; - explore the function using the derivative and build a graph of the function, apply various integration methods, apply certain integrals; - explore and calculate integrals of the first and second kind; **Skill**: solving applied problems by transferring data to classical mathematical problems; finding optimal methods for solving practical problems; methods for solving differential and integral problems.
2	**Algorithms and data structures**	**Professional competencies**	**Know**: algorithmic methods of algorithms; structural features, organization and practical implementation of algorithms; bases and prospects for the development of new technologies. **Be able to**: consider the properties of algorithms and situations in which these algorithms can be useful; create various programs using fundamental computational algorithms and their properties, leading to linear, branched and cyclic types of algorithms; process arrays using various internal sorting methods; explore related to the analysis of algorithms; analyze the effectiveness of algorithms; practice building models and data structures, conduct a 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;
2	**Programming languages and technologies**	**Professional competencies**	**Know:** main elements language programming: types data, operators; library function capabilities, abstract and user-defined types, structures, functions, etc.; programming language development trends and scope; software development tools; ergonomic, aesthetic, psychological requirements for software; methods of structural analysis. **Be able to:**conduct system analysis, design, coding, configuration and testing, consolidation and output of the software product; conduct a primary analysis and evaluate the results of the identified limitations; look for critical points of view of the project **Skills**Keywords: basics of automating problem solving, skills in working with modern programming languages and their tools and the capabilities of an integrated processing environment.
2	**OS**	**Professional**	**Know:** fundamental principles design operating rooms systems;

		competencies	purpose, functions, classification of operating systems; principles of computer resource management; the concept of multiprogramming, processes and threads; principles of virtualization and mobility of operating systems. **Be able to:**implement basic algorithms for scheduling and synchronizing processes and threads, memory management, disk scheduling; develop multi-threaded applications; take into account the features of work in a particular operating system; use operating system tools. **Skills:**installing operating systems, managing accounts, configuring the user's working environment, connecting and configuring hardware devices, managing disks and files with systems, configuring network settings.
3	**Computer networks**	**Professional competencies**	**Know:**evaluation and control of LAN performance; computer, server equipment and peripheral devices, types of their compatibility, technical characteristics; resource management; calculation of costs for the design and installation of LAN. **Be able to:**organize updating of software versions; development of regulations for the organization for servicing the LAN; control software version updates; develop a preventive action plan. **Skills:**own: methods of building a network; current protocols and their features; skills about network optimization methods
3	**Database (Data) Basics**	**Professional competencies**	**Know:**principles of organization of modern databases and database systems; main categories and the concept of a database; relational data format; database design methods; **Be able to:**- build the form of the subject area and create databases associated with it; organize the processing of information in the database; organize the maintenance of the integrity of the database. **Skills:**work in a special database management system, training in the creation of basic objects in the database; distribution of the main functions, the need to release the task; creating applications in the database..
Basic disciplines			
Selectable Component			
1	**Computer architecture Computer and communication technology**	**Professional competencies**	**Know:** main principles And main concepts building architecturecomputing systems; types computing systems And their architectural peculiarities; principle And organization work major logical blockscomputer systems; information processing processes at all levels

	systems		computer architecture; main components of computer systems software; basic principles of resource management and organization of access to these resources. **Be able to**: receive information about the parameters of the computer system.; adding additional coatings And setting connections between elementscomputer system; Installation and configuration of software for computer systems. **Skills:**analysis of computer operation, modernization of computer hardware.
			Know:about the hardware of computer and communication systems, as well as their technical characteristics and functionality. **Be able to**: to apply knowledge and skills in the preparation of applied practical problems using the technology of computer and communication systems. **Skill**: the use of basic means of computer and communication systems technology
2	**Application program package / appliedsoftware**	**Professional competencies**	**Know:**the concept of an application package; the stages of development of an application package; the concept of office application packages; the concept of desktop printing systems; the concept and purpose of technical means of a printing system; the basics of working with the adobepagemaker printing system. **Be able to**: classify software products depending on their purpose; create application software packages; create texts with publications in Adobe PageMaker; work with adobepagemaker objects; format texts adobepagemaker. **Skills:**creation of publications by means of the Microsoft Word program with layout and layout capabilities; creating documents in Microsoft Office Publisher; creation of booklets and layout layouts in Microsofficepublisher; work in printing systems; work with objects, text and techniques in Adobe PageMaker; creating and receiving multi-page publications in Adobe PageMaker.
			Know: classification of system and application software; theoretical foundations of applied software; tasks and possibilities of basic and applied computer software. **Be able to**: apply application software, covering all the possibilities and purpose of the basic and application software of a computer. **Skills**: modeling methods, information technology, management

2	**Informational resources / Information Systems**	**Professional competencies**	**Know**: principles of work with information resources and systems; the basics of the organization and functioning of the Internet connection; ways of using information and communication services of the Internet; **Be able to**: create and format HTML documents; create text with links to other hypertext documents; use information resources to obtain the necessary information; **Skills:**work with browsers; search and analysis of information resources; methods and techniques for creating hypertext documents; methods for searching and analyzing information on the Internet; work with modern information resources.
			Know: ways of using information and communication services of the Internet; Internet technologies as an infrastructure for conducting electronic business; the structure of the information environment or information space, including information flows: various information systems and information resources: principles and methods of using technical devices; **Be able to:**search for information on the Internet; classify information systems and distinguish their characteristic features; evaluate the quality and efficiency of information resources use: **Skills**: methods of searching and analyzing information on the Internet; search for information from various sources; analysis of relevant information, specification of demand in order to increase search efficiency; work with modern information resources.
2	**Discrete mathematics / mathematical statistics**	**Professional competencies**	**Know**: algebraic methods for describing models.; elementary functions, properties of the algebra of logic and their analytical expression; basics of logical calculation of words and predicates; methods for solving classical problems formulated in terms of combinatorics **Be able to:**apply combinatorial configurations to solve problems; determine the type of a binary relation and its properties; perform sets; represent columns in various ways; perform operations on graphs; find the shortest path to graphs; DNF. **Skills**: using the basic tools of discrete mathematics to solve applied tasks; methods of construction, analysis and application of discrete models in professional activities.
			Know:method for estimating the probability of the main numerical characteristics of random

			quantities; verification of the hypothesis about the parameters and distribution laws of random variables; **Be able to**: calculate the probability of a random event; **Skill**: calculation of numerical characteristics of random variables;
3	**Theory of automata and languages / languages of algorithmization and programming**	**Professional competencies**	**Know**: basic concepts of formal languages and automata theory; algorithmic languages; basics of programming **Be able to**: analyze basic information about tasks that require the creation of formal languages, write formal definitions of such languages, create and analyze tools for the algorithmic analysis of such languages; programming in various algorithmic languages. **Skill**: solving problems that arise in the design and implementation of software projects aimed at creating compilers and other tools for processing formal languages.
			Know: algorithmic methods; features of the structure, organization and practical implementation of algorithms; fundamentals and prospects for the development of new technologies **Be able to:**consider the properties of algorithms and situations in which these algorithms can be useful; create various programs using fundamental computational algorithms and their properties, leading to a linear, branched and cyclic type of algorithms; process arrays using various internal sorting methods; explore related to the analysis of algorithms; analyze the effectiveness of algorithms; apply in practice the construction of models and data structures, conduct a 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
3	**Fundamentals of Software Development / Computer Software**	**Professional competencies**	**Know:**software life cycle; object-oriented programming; theory and methods of classification; elements of complexity theory. **Be able to:**apply mathematical methods to solve practical problems, the physical laws of computer technology; program in one of the algorithmic languages; apply information search algorithms in software development; **Skill:**basics of algorithmization;
			Must know:computer hardware.

			Be able to: work with computerization software. **Skills**: system, service and application software.
3	**Fundamentals of Robotics and Artificial Intelligence / robotic systems and complexes**	**Professional competencies**	**Know**: methods for constructing data structure-oriented algorithms **Be able to**: competently create and correct programs, design programs, express your opinion using the program. mastering the basic principles of building and using modern algorithms and programs for solving problems in computer science using various techniques; **Skills**: programming; studying the basics of modern programming languages and describing programming systems, developing creative thinking and skillful application in practice
			Know:methods for constructing data structure-oriented algorithms **Be able to**: competently create and correct programs, design programs, express your opinion using the program. mastering the basic principles of building and using modern algorithms and programs for solving problems in computer science using various techniques; **Skills:**programming; studying the basics of modern programming languages and describing programming systems, developing creative thinking and skillful application in practice.
3	**Computer modeling / Mathematical and computer modeling**	**Professional competencies**	**Know:**model classes of models and methods for 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; **Be able to:**apply a systematic approach in the study, design and operation of information systems, develop modeling algorithms and implement them using algorithmic languages and modeling application packages, automate the design process using modeling databases. **Skill:**the use of computer simulation tools to create the psychological comfort of the user.
			Know: methods for solving basic mathematical problems - integration, - differentiation, solving systems of equations using linear and transcendental equations and computers; basic principles for constructing mathematical models; main types of mathematical models. **Be able to:**develop algorithms and programs for solving computational problems, taking into account the required accuracy of the result obtained; choose analytical methods for studying mathematical models; apply numerical methods

			research of mathematical models. **Skill:**solve computational problems using computer simulation.
3	**Python 3 Programming / Python Programming Fundamentals**	**Professional competencies**	**Know:**paradigms, architectural features, semantics and syntax of the Python programming language, purpose, structure and properties of the main structures and constructions of the Python language, modules and packages for solving various applied and scientific problems. **Be able to:**- to develop mathematical methods and algorithms for solving various problems, - to use an integrated development environment for developing and debugging a program. **Skills:**skills in reading, writing, debugging and testing programs in a high-level programming language in an integrated design environment.
			Know: to form skills in the Python programming system. **Be able to**: programming algorithmize in the development of thinking. ICT at the professional level. Modeling as a means of knowledge. Machine learning, data analysis and visualization. **Skill**: comparing different URLs with parts of Python code, working with databases, creating HTML representations for display on user devices.
3	**Numerical methods / optimization methods and operations research**	**Professional competencies**	**Know:**fundamentals of error theory and approximation theory; basic numerical methods of algebra; methods for constructing elements of the best approximation; methods for constructing interpolation polynomials; methods of numerical differentiation and integration; methods of numerical solution of simple differential equations; methods of numerical solution of partial derivatives of differential equations.; **Be able to:**solve algebraic and transcendental equations in numerical form, using for this the consequences of the theorem on contraction images .; **Skill**: practical assessment of the accuracy of the results obtained in solving computational problems based on the theory of approximation; technologies for applying computational methods to solve specific problems from various areas of mathematics and its applications.
			Know:function optimization methods. Methods for searching for extremums of a function of one variable. **Be able to**: apply optimization techniques to complete tasks **Skill:**technology of applying computational methods to solve specific

			problems from various areas of mathematics and its applications.
4	**Object Oriented Programming / Embarcadero Delphi XE Programming**	**Professional competencies**	**Know**: what is an object and a class, the basic principles of object-oriented programming, the principles of building classes, the criteria for checking the correctness of building classes, the main trends in the development of object-oriented programming technologies. **Be able to**: apply modern methods of object-oriented programming when coding software systems of various levels. **Skill**: Working with the C++ Builder visual programming environment.
			Know: basic principles of object-oriented programming, principles of building classes, SQL Server, Oracle, Multi-Device, SQLite, 3D graphics, float and Path animation. Programming in the Embarcadero Delphi XE environment. **Be able to**: create sequence diagrams from methods in Delphi applications. **Skill:** Advanced code formatting options.
4	**Hardware and software information protection / Information Security**	**Professional competencies**	**Know**: basic concepts and directions in the protection of computer information, principles of information protection, examples and principles of classification of threats to the security of computer systems; methodology for evaluating the results of applying organizational and technical solutions to ensure information security. **Be able to**: configure the security tools installed in the operating system, analyze the security of the computer and the network environment using a security scanner; installation and use of one of the tools for encrypting information and organizing data exchange using an electronic digital signature; assessment of the effectiveness of the applied hardware and software to ensure information security. **Skills**: security audit of information systems, methods of system analysis of information systems; monitoring the implementation of plans for technical counteraction to threats to information of the organization.
			Know: methodology for analyzing the effectiveness of the software; Basic concepts, goals and objectives for the enterprise; essence and components of software; principles of organization and stages of software development; factors affecting the organization. **Be able to**: to analyze the effectiveness of the software; use the principles of organization and stages of software development; identify factors that affect the organization

			Skills:information systems security audit, system analysis methods information systems
4	**Methods of teaching computer science / methodology and technology of teaching computer science**	**Professional competencies**	**Know:**basic concepts of teaching informatics, programs and textbooks developed on their basis; the essence and ways of differentiated and specialized education in the basics of computer science; requirements for the classrooms of computer technology in the school and the organization of work in it; the content of the teacher's work in organizing, planning and providing informatics lessons. **Be able to**: formulate the goal of the lesson; - plan the educational process taking into account the goals of the topic or lesson, predict the cognitive activity of students; - select educational material and teaching aids for the lesson in accordance with its objectives; - plan the study of educational material during the year, topics. **Skills**: main approaches to mastering concepts, teaching aids, forms, methods and means of monitoring and evaluating knowledge, technologies for teaching informatics
			Know: technology and methods of teaching information processes. Technology and methods of teaching the basics of algorithmization. **Be able to**: apply technology and teaching methods. Computer modelling. **Skills**: software And mathematical collateral.Fundsinformatization. Social informatics. Theoretical informatics.
Professional disciplines			
Required Component			
2	**3D graphics and animation**	**Professional competencies**	**Know:**modern trends in the development of graphics and design; area of use of computer graphics; the architecture of the main hardware and software tools for working with network technologies; color representation model. **Be able to:**use basic visual techniques and materials; use computer graphics tools in the design process. **Skills:**work with raster, two-dimensional and three-dimensional vector graphics software; basic functionality of modern graphic systems; organization of dialogue in graphic systems.
3	**Information management**	**Professional competencies**	**Know**: about risks; subject and information technologies; information systems, decision-making process, functional IT, IT structure; place of IP at a manufacturing enterprise, functional sections of IP; **Be able to**: assess the expected risks of acquiring IP, implement IP and use IP; analyze the control system for subsequent automation;

			Skill: definition of information management tasks and methods for their solution.
Optional components			
3	**Information systems / information systems theory**	**Professional competencies**	**Know:**the composition and structure of information systems, hardware and software and an idea of the structure of the information process, to know the basics of organizing information processes; **Be able to:**apply system analysis in the formulation and algorithmization of information system tasks, determine the conceptual model of information systems .; **Skill**: system analysis in the formulation and formalization of information system tasks, the definition of a conceptual model of information systems.
			Know: basics organizations information processes; methods formaldescriptions of information processes and objects, principles of its application in the development of computer technology and software; main stages; Be able to: apply the basic models and means of information transmission to optimize modern computer systems. **Skills:**Basic concepts of information theory: the concept of classification and measurement of information, transmission speed and mathematical models of signals.
3	**Web programming / programming technology**	**Professional competencies**	**Know:**HTML hypertext markup language; basics of working with programs for creating web pages programming languages Java Script, VRML **Be able to**: plan the amount of work when developing a Web page; develop the structure and design of the Web page; create web pages in the JavaScript programming language; publish pages on the global Internet. **Skill:**work with the means of processing and debugging the client and server parts of Internet applications.
			Must know: programming languages and technologies **Be able to:**plan and organize a scientific, creative approach to the development of means and methods, programming technologies **Skills**: as a result of studying the discipline, the student must master the skills of compiling, setting up and testing the program, as well as developing and operating interface objects.
3	**Theoretical foundations for the development and implementation of languages**	**Professional competencies**	**Know:**basics of task algorithmization, methods of programming automation; data types and operator types of the C++ language; subroutines, standard library functions. Methods for building programs using standard library

	programming / SQL language		modules, dynamic data structures; methods for correcting errors in programs and their implementation. **Be able to:**create reporting programs for processing one-dimensional and two-dimensional arrays, string data; create programs using procedures, functions, and standard modules; program tasks for processing data structures stored on external media. **Skills:**drawing up block diagrams of various algorithms; development of linear, branched, cyclic structures of algorithms; organizing the data structure required by the report; development and testing of programs using the means of the programming language; development and design of programs in the environment with ++; Programming skills in C++ in the Microsoft Visual C++ integrated environment.
			Know: the main provisions of the theory of databases, data warehouses, knowledge bases; basic principles of building a conceptual, logical and physical database model; modern tools for developing database schemas.; Be able to: create database objects in modern database management systems and manage access to these objects; work with modern Case database design tools; create and correct database schemas; develop application programs using the SQL language; **Skills**: work with database objects in a specific database management system; use of database filling tools; applying standard methods for protecting database objects.
4	**Theory of programming languages and methods of translation / high-end programming language**	**Professional competencies**	**Know:**the main provisions of the theory of formal grammars of programming languages, automata, methods of parsing and translation of formal grammar classes used to describe the basic structures of programming languages.; Be able to: formally describe the syntax and semantics of simple procedural and domain-oriented programming languages, develop parsing algorithms for commonly used formal grammars, use standard terminology. reading scientific articles and using literature for independent solution of research problems related to the development of languages and methods of translation; **Skill:**apply the main methods of methodological approaches and promising

			areas of work in the field of formal methods for describing and translating languages.
			Know:formal description of the syntax and semantics of simple procedural and domain-oriented programming languages, development of parsing algorithms for the most commonly used formal grammars, use of standard terminology definitions. **Be able to:**create document structure, use basic language tags, use tags to format document, use META instructions, embed videos, create lists, use hyperlinks, use CSS, use div element, create registered design site structure, create Rubber Design site structure, add files JS, use functions and scripts, work with situation operators, use loop operators, work with loop arrays. **Skills:**creation of web-pages, layout; using css styles, creating interactive; writing scripts in the JavaScript client-side programming language
4	**Parallel computing / parallel programming and multiprocessor computing systems**	**Professional competencies**	**Be able to**: create and program software products using the main models of parallel computers; the basics of parallel data processing Be able to: apply parallel algorithms in programming languages such as MPI, OpenMP, PVM **Skill**: construction of parallel analogues of computational algorithms.
			Know:efficient parallel computing algorithm for solving applied problems. **Be able to:**apply computer technology in the automation system; **Skill**: selection of optimal network technologies for information support of the control system
4	**Systemartificial intelligence / theory of artificial intelligence**	**Professional competencies**	**Know**: the history of the development of systems and methods of artificial intelligence; tasks solved by artificial intelligence methods; classification of artificial intelligence systems; artificial intelligence languages. • **Be able to**: teach artificial intelligence systems; choose artificial intelligence methods for solving practical problems; calculate predicates; create computer programs using object-oriented programming methods to solve practical problems using artificial intelligence methods. **Skills:**practical implementation of the artificial intelligence system; visual demonstration of the results obtained by artificial intelligence methods;

			applications applications artificial intellect; development computerprograms for solving practical problems using artificial intelligence methods.
			Know:the history of the development of artificial intelligence; tasks solved by artificial intelligence methods; classification of artificial intelligence systems; artificial intelligence languages. • **Be able to:**teach artificial intelligence systems; choose artificial intelligence methods for solving practical problems; calculate predicates; create computer programs using object-oriented programming methods to solve practical problems using artificial intelligence methods. **Skills:**practical implementation of the artificial intelligence system; visual demonstration of the results obtained by artificial intelligence methods; applications applications artificial intellect; development computerprograms for solving practical problems using artificial intelligence methods.
4	**Multimedia technology / multimedia software**	**Professional competencies**	**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:**implement, store, process, transmit and publish digital information, including audio, video, video and multimedia products on a personal computer and global computer networks; store finished multimedia products on modern storage devices. **Skill**: Programming with Flash Professional. methods and means of creating modern multimedia products

			Know:digital video and sound for presentation of design objects and development of design projects; functionality of modern programs used to create multimedia products.; **Be able to**: implement, store, process, transmit and publish digital information, including audio, video, video and multimedia products on a personal computer and global computer networks; store finished multimedia products on modern storage devices. **Skill:**programming in the Flash Professional environment. methods and means of creating modern multimedia products
4	**Database programming / PHP programming**	**Professional competencies**	**Know:**basic concepts of building database models, methods and tools for designing relational databases, features of building programs for interacting with databases, organizing a DBMS, ways to protect data using DBMS, the basics of restricting access rights, the basics of the SQL language for working with data organized in the form of relational databases .; **Be able to**: to program databases in a programming environment; **Skill:**development of database software for solving economic and scientific and technical problems.
			Know:knowledge of the PHP programming language, development of skills in designing and programming web applications; **Be able to**: Use the PHP programming language to develop web applications. The PHP language was created to solve specific practical problems in the Internet environment. **Skill:** design web applications With using theoretical Andpractical skills in PHP programming environment