Kazakh Humanitarian Juridical Innovative University
Faculty of Information Technology and Economics
Department of "Informatics and mathematics»

6B06124 Computer facilities and the software
CATALOGUE OF ELECTIVE COURSES

year of admission – 2019

Semey, year 2019

Academic degree bachelor of engineering and technology in the educational program 6B06124 «Computational technology and software»

Course of education:
5B057 – Information technologies

№	Discipline	Amount of credits		Prerequisites	Postrequisites	Prerequisites Postrekvizity Brief description indicating the purpose of the study, executive summary, and expected results of the study (knowledge, skills, competences)
		PK	ECTS			
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	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
2	Fundamentals of safety and life	2	There is a need for legal, historical and biological knowledge that students receive in secondary schools	Sociology, Political Science	**Aim.** To form ideas about the safety of life in human life and the possibility of regulating the processes of mutual influence of the environment and man. **Content.** The study of the basic concepts of life safety, ecology, problems of modern civilization and the environmental consequences of economic and other human activities in the intensification of environmental management, emergencies, civil defense. Disclosure of principles and methods of protection of the population from various environmental factors, legislative and legal acts in the field of bzh. Preservation of the environment and biological resources **Expected results:** students must know: legislative framework of safety and environmental control, as well as methods for identification, eliminating the influence of harmful factors on human beings and the environment, and ensure comfortable conditions for life and human activities; to be able: to systematize safety standards for use in professional activity; to choose methods of protection against hazards in relation to their professional activities and select methods for providing comfortable living conditions; to own skills of life safety in production conditions and in emergency situations, skills of first aid.
BASIC DISCIPLINES					
Be sure to select (BSS)					
1	Introduction in specialty	5	Scool of Informatics Course	Information theory	**Aim:** Learning the knowledge and skills of using modern software **Content:** Introduction. Basic concepts and information about the specialty. Information computer systems. Educational and scientific complex of higher educational institutions. Higher education in Kazakhstan. The main documents on the organization and conduct of classes, their content. **Expected result:** **Know:** - the volume and level of requirements for bachelors in "Computer science and software", the content of the curriculum for the period of study; - physical basis of PC operation, its main technical characteristics and functionality; - professional problems in the field of computing and telecommunications; - general description of specialty, field, objects, types of professional activity, tasks of design, research, organizational, managerial and operational activities; - features a variety of operating systems and architecture. **Able to:**

					- to put, formulate problems of technical projects for the implementation of programming tasks and technical solutions in the professional field; - identify technical and logical problems in the analysis of specific situations for programming, suggest ways to solve them and evaluate the expected results; - to systematize and generalize information, to prepare references and reviews in professional activities, edited, abstracted, reviewed texts; - use basic and special methods of information analysis in the field of professional activity; - to develop and prove variants of effective decisions; - critically evaluate from different sides (production, motivational, institutional, etc.) the development trends of objects in the field of professional activity; - knowledge gained in the study of mathematics, physics; - plan and conduct research, analyze and interpret the data obtained; - analyze, program, design and operate software and hardware systems and security systems; - use modern technical means necessary in engineering practice. **Possess skills:** - special technical, economic terminology and vocabulary, - self-mastery of new knowledge, using modern educational technologies; - work with technical documentation and literature to solve problems of computer engineering and telecommunications; - methods of mathematical, simulation and computer simulation of processes and devices of computer technology.
1	Basics of work on a personal computer	5	Scool of Informatics Course	Information theory	**Aim:** Familiarize students with the system and methods of studying a personal computer, the programs with which they will work, the trends of development, as well as the development of their own potential in modern conditions. **Content:** Hardware. Introduction to Windows. Create a basic text document. The toolbar editor “WORDPAD”. The main functions of the editor “WORDPAD". Additional functions of the editor “WORDPAD”. **Expected result:** **Know:** - the volume and level of requirements imposed to bachelors in the specialty "Computer facilities and software»; - the general characteristic of specialty, area, objects, types of professional activity, tasks of design, research, organizational and administrative and operational activity; - features of different operating systems, architecture. **Able to:** - to identify problems of a technical and logical nature in the analysis of specific situations for programming, to suggest ways to solve them

					and to evaluate the expected results; to systematize and summarize information, to prepare references and reviews on professional activities, to edit, to refer, to review the texts; - use basic and special methods of information analysis in the field of professional activity; - to develop and prove variants of effective decisions; - critically evaluate from different sides (production, motivational, institutional, etc.) trends in the development of objects in the field of professional activity; - apply the knowledge gained in the study of mathematics, physics; - plan and conduct research, analyze and interpret the data obtained; - analyze, program, design and operate software and hardware systems and security systems; - to use modern technical tools necessary in engineering practice. **Possess skills:** - special technical, economic terminology and vocabulary of the specialty
2	Application Packages	5	Scool of Informatics Course	Setting up, repair, optimization and maintenance of computer systems, Object-oriented programming Delphi, Artificial intelligence systems	**Aim:** Familiarize students with the software that can be used in the preparation of printed publications on the computer, as well as with the technical means of integrated publishing systems, the practical development of the computer, obtaining practical skills in working with desktop publishing systems **Content:** Classification of software products. Definition and stages of development of application packages. Classification and types of application packages. Problem-oriented and method-oriented application packages. General purpose. Automatic transmission of computer-aided design and multimedia software. Office of the application packages. A desktop publishing system. Artificial intelligence system **Expected result:** **Know:** - the concept of an application package; - stages of development of the software package; - history and stages of book printing development in Kazakhstan; - the concept of office application packages; - the concept of desktop publishing systems; - the concept and purpose of technical means of publishing systems; basics Adobe Page Maker publishing system. **Able to:** - classify software products according to their purpose; - to classify the software packages in the types of; - to create texts which are published in Adobe Page Maker; - work with objects in Adobe Page Maker; - to format texts in Adobe Page Maker. **Possess skills:** - creation of publications by means of the

					program Microsoft Word with the possibilities of layout and typesetting; - create documents in Microsoft Office Publisher; - techniques and ways to create booklets and the layout work in Microsoft Office Publisher; - work in publishing systems; - techniques and skills for working with text and objects in Adobe PageMaker; - techniques and create multi-page publications in Adobe Page Maker.
2	Introduction to computer science	5	Scool of Informatics Course	Setting up, repair, optimization and maintenance of computer systems, Object-oriented programming, Intelligent animation	**Aim:** Formation of students in a systematic form of the concept of approximate (numerical) methods for solving practical problems, computer simulation methods, sources of errors and methods for assessing the accuracy of the results, mastering specific numerical methods for solving various problems. **Content:** What is computer science? Methods of estimation of errors of calculation. Numerical methods for solving equations. Numerical methods for solving systems of equations. Numerical integration. Methods of approximation of functions. Linear programming problem. Mathematical statistics. **Expected result:** **Know:** - classification of system and application software; - theoretical basis of computer software; - purpose and capabilities of basic and applied computer software. **Able to:** - to form approximate (numerical) methods of applied problems; - to assess the accuracy of the results, to apply numerical methods in various fields of practice. **Possess skills:** work with the computer as a means of information management.
3	Information theory	5	Introduction in specialty	Aautomated systems of date processing, Computer networks and telecommunications, Programming language and technologies	**Aim:** Introduction to the basic concepts of information theory, the study of models of information processes and their organization at the physical and channel level. **Content:** Basic concepts and problems of information theory. The measurement information. Data transfer rate and bandwidth of communication channels. Mathematical models of signals. Channels and communication systems. Information coding. Quantization of information. **Expected result.** **Know:** - on the concept of information, methods of transmission of digital information, information processing, preservation and their technical characteristics and functionality, the basis of the theory of data compression. **Able to:** - use basic models and means of information transmission to optimize modern computer systems.

					Possess skills: - presentation of information; - methods and means of determining the amount of information; encoding and decoding information.
3	Information technologies	5	Basics of work on a personal computer	Technics of computer and communication systems, Programming language, Database design	**Aim:** Introduction to the basic concepts of information and information technologies, classification of information technologies by fields of application. **Content:** The Information. Information technology. Information technologies in the fields of application. Information security. The main types of threats to information security. Means of information protection. Identification and authorization of network users and resources **Expected result:** **Know:** - basic concepts: information and information technology; - technologies for collecting, storing, transmitting, processing and providing information; - classification of information technologies by fields of application: processing of text and numerical information, hypertext methods of storage and presentation of information, document markup languages; - general information about computers and computer networks: the concept of information system, data, databases, personal computer, server; - assign the computer a logical and physical structure of computer, hardware and software; - processor, RAM, disk and video subsystems; - peripherals: interfaces, cables and connectors; - personal computer (PC) operating system, file systems, file formats, file management programs; - local networks: protocols and standards of local networks; topology of networks, structured cabling systems, network adapters, hubs, switches, logical network structuring; - identification and authorization of users and network resources; - General information on global computer networks(Internet), addressing, domain names, data protocols, hypertext presentation, WorldWideWeb network (WWW), e-mail, server and client software; - information security: main types of threats, ways to counteract threats **Able to:** - work with graphical operating systems of a personal computer (PC): enable, disable, manage sessions and tasks performed by the operating system of a personal computer; - work with file systems, different file formats, file management programs; - work in applications: text and table editors, presentation editor, use information from technical documentation and help files. **Possess skills:**

					- presentation of information; - search for files, computers, and network resources; methods and means of determining the amount of information.
4	Object-oriented programming Delphi	3	Application Packages	Object-oriented programming C ++	**Aim**: to introduce the concepts of object, method, event, class, polymorphism, encapsulation and get acquainted with the object-oriented programming environment Borland Delphi. Programming training in Delphi environment. **Contents**: evolution of programming technology. Basic concepts of object-oriented languages. Operators, structures, and unions. Operating personnel. Introduction to the DELPHI programming environment. Create projects in Delphi and make changes to them. Object-oriented programming concept. Records and dynamic memory. Classes and methods of object-oriented languages. Inheritance (inheritance) and decomposition. Components of the class. Class declaration. Object-oriented design. **Expected result:** **Know**: – fundamentals of algorithmization and principles of algorithm construction.; – the concept of programming.; – classification of programming languages; – the algorithms to solve problems; – methods and important ways of constructing algorithms. **Able to**: – object-oriented design; – develop programs in an object-oriented programming environment.; – use object-oriented programming languages to solve problems in the subject area; – to create application software packages. **Possess skills**: – object-oriented programming languages; – algorithmization and work in the programming environment; – practical skills of object-oriented programming.; – fundamentals of object-oriented design and analysis.
4	Object-oriented programming	3	Introduction to computational informatics	Functional programming	**Aim:** Introduction to modern approach to programming in objects, acquisition of skills of writing programs in object-oriented languages**.** **Content:** Introduction to OOP. Structural features of object-oriented languages. Inheritance and composition. Fundamentals of object-oriented analysis and design. **Expected result:** **Know:** - what is a class and object; - the basic principles of object-oriented programming; - principles classes; - criteria for checking the correctness of the construction of classes;

					- main trends in the development of object-oriented programming technologies. **Able to:** - use modern methods of object-oriented programming in coding software systems of different complexity levels; **Possess skills:** - work with the environment of visual programming Delphi; - basics of algorithmization.
5	Probabilities theory and Math statistics	5	Scool of Mathematics Course	Information security and information safety, Computer modeling	**Aim**: to obtain generalized knowledge of any probabilistic and statistical systems, to identify common patterns of their construction and operation. Identification of objects of application of the acquired knowledge with the use of modern information technologies. **Contents**: the Subject of probability theory and mathematical statistics. Basic concepts of probability theory. Trials and events. Actions on events. Random event. Types of random events. Basic formulas of combinatorics. The classical definition of probability. The theorem of adding the probabilities of incompatible events. Full group of events. Opposite events. Independent and dependent events. Multiplication theorem for independent events. Conditional probability. The solution of problems on conditional probability. **Expected result:** **Know:** - regularities in random and information processes (type of distribution, numerical characteristics, accumulation, processing, distribution, etc.)) **Able to:** - create mathematical and computer models of random phenomena in various fields of human activity; **Own skills:** - information about the main scientific achievements in the theory of probability and mathematical statistics;
5	Discrete mathematics	5	Scool of Mathematics Course	Information security, Mathematical and computer modeling	**Aim:** Acquaint students with the most important sections of discrete mathematics and its application in computer science. **Content:** Set, element of set, subset. Operation on sets and their properties. Binary relations and their properties. The equivalence relation and split into classes. Types of functions: injections, surjections and bijections, inverse and compositions. Dirichlet principle. Construction of the truth table of logical formulas. Methods of proof: direct, inverse, negative, mathematical induction. Combinatorics. **Expected result:** **Know:** - basic concepts of sets; - algebraic methods model description; - elementary functions of logic algebra, properties and their analytical representation; - foundations of the logical calculus of propositional and predicate; - methods for solving classical problems

					formulated in terms of combinatorics. **Able to:** - to apply combinatorial configuration for solving problems to determine the type of binary relations and its properties, perform operations on sets to represent graphs in different ways, to perform operations on graphs, finding shortest path graph, construct the truth table Boolean function, perform the identity transformation, find SDNF, SCNF to determine the minimum DNF. **Possess skills:** - use of basic tools of discrete mathematics for solving applied problems; method of construction, analysis and application of discrete models in professional activity.
6	Operating systems	5	Information and communication technology	Object-oriented programming C++	**Aim:** Training in knowledge and skills of using modern software, obtaining knowledge about modern operating systems, their functional architecture, the resources and methods implemented by them, management of resources of computer complexes. To teach knowledge and skills in the use of modern software, to familiarize with the effective algorithms for solving various scientific and technical problems. **Content:** General information about operating systems. History of operating systems. The architecture of the operating system. The basic functions of the OS. Processes and flows. Memory management. File system. Input and output management. The management of real memory. Configure network settings and share resources on local networks. Programming with system calls on the Windows operating system in the Linux System shell **Expected result:** **Know:** - the concept, principles, types and functions of operating systems; operating environment; - machine-independent properties of operating systems. **Able to:** - install and maintain operating systems; - take into account the peculiarities of work in a particular operating system, organize support for applications of other operating systems; - use the tools of the operating system. **Possess skills:** - security and fault tolerance of operating systems; - principles of construction of operating systems; ways of organizing device support, hardware drivers, network operating systems.
6	Operating systems, environments and shells	5	Information and communication technology	Functional programming	**Aim:** Study the theoretical principles and algorithms underlying the development of modern operating systems and shells, the development of problems in this area, a review of research areas, obtaining skills of installation, configuration and administration of operating systems Win32 and UNIX families. **Content:** Introduction. History of operating

					systems and shells. The basic functions of the OS. Processes and flows. Memory management. File system. Input / output control. **Expected result:** **Know:** - current state of the level and directions of development of computer technology and software; - main stages, methods, means and standards of software development; - main types of operating systems, operating system resource management principles; - features of operation in specific operating environments and shells; - service software tools; - methods of organizing, storing and processing information on the computer (technology of processing information on the computer). **Able to:** - to work in a chosen environment; - to learn a new operating system or shell program; - to obtain information about users, processes, directories, reference on system commands; - to perform a message exchange with other users; - create and view directories, copy, move and delete files, manage file access mode; - to create, view and merge text files, search pattern, search file according to the specified parameters, to use pipelines and redirection input / output. **Possess skills:** - security and fault tolerance of operating systems; - principles of construction of operating systems and shells; ways of organizing device support, hardware drivers, network operating systems.
7	Programming languages and technologies	5	Information theory	Programming on PHP	**Aim:** Teach students the basic principles and methods of building programs in programming languages, to familiarize with the semantics of programming languages, formal languages specifications, object-oriented specifications. **Content:** Structural, modular, object - oriented programming. Basic concepts and mechanisms of the environment of input and execution of programs. Base data type. Basic principles of organization and structuring of programs. Key concepts and linguistic means to describe software objects. Operating personnel. The main means of data processing. Preprocessor tools. Algorithmic basis for writing effective programs. Basic principles and means of organization of the software interface. Functions. Basic principles of program development. **Expected result:** **Know:** - programming methods and technologies; - basic data processing algorithms; - about modern programming languages; - about the structure of computing systems;

					Able to: - develop algorithms; - to implement algorithms in the programming language high-level; - implement the methods of analyzing and processing data; - work in programming environments. **Possess skills:** - methods and technology development of algorithms; - high-level programming language; - work in various programming environments.
7	Programming languages	5	Information technologies	Web programming	**Aim:** Consider the basics of building languages and programming methods, the study of the basic types and structures of data and algorithms for their processing, teaching students the basics of programming based on C++programming language. **Content:** Basic concepts of programming languages. Lexical analysis. Semantic analysis of program code. Object-oriented programming (OOP). Programming in language C **Expected result:** **Know:** - terminology of discipline; - basic structures and tools that are used in programming languages such as C++: - main structures and types of C++ data; - main methods in the development of algorithms (recursion, backward, branch and boundary methods, analysis of arithmetic expressions); basic algorithms; dialects C++, including used in programming microcontrollers; library of standard programs. **Able to:** - to apply programming techniques in the development of information systems; - determine data structures in the design of algorithms in the process of solving problems; - break down the solution of a complex problem into a sequence of more simple tasks. **Possess skills:** - use the library of standard programs that are included in the programming language C++; - self-settling in the programming language that you must use when solving problems.
8	Computer networks and telecommunications	5	Information theory	Modern methods and tools Java programming, Fundamentals of component technologies	**Purpose**: to Expand the theoretical base in the subject area, and to instill in students practical skills to work with special information support capabilities. **Contents**: definition of local networks. Local network topologies. The main components of the network. Types of Ethernet communication lines. The oldest standards of the network. Ethernet, TokenRing, FDDI **Expected results**: as a result of the study of the discipline the student must **know**: - The main components of the network, types of communication lines - IP address types - Methods and means of network protection

					- PHP syntax - SQL syntax - Types of domain and types of hosting **Able to:** - Create schemes HP - Clean your PC from viruses - Apply a digital signature - To apply the principles of encryption - Create PHP applications - Create websites with DB - Create a database using phpmyadmin and SQL - To process form data **Own skills :** - Create a LAN scheme - Perform network configuration and administration - Create applications in PHP - Creation and maintenance of websites - Publication of web-sites on the Internet
8	Technics of computer and communication systems	5	Information technologies	Modern methods and means of NET programming, Component technologies and distributed software development	**Aim:** Development of professional competences of students necessary for realization of professional activity, formation of abilities and skills on performance of the works connected with maintenance and repair and communication systems. **Content:** Control diagnostics and recovery of computer and communication systems. Systematic maintenance of computer and communication systems. Debugging and technical testing of computer and communication systems. Installation, configuration of the software. **Expected result:** **Know:** - features monitoring and diagnostic devices hardware and software systems; - main diagnostic methods; - hardware and software functional control and diagnosis of computer systems capabilities and applications of standard and special test equipment to locate the ground fault SWT; - use of service tools and built-in test programs; - hardware and software configuration of computer systems and complexes; - installation, configuration and configuration of the operating system, drivers, resident programs; methods to ensure the stable operation of computer systems and complexes; - rules and norms of labor protection, commercial - safety, industrial sanitation and fire protection **Able to:** - monitor, diagnose and restore the performance of computer and communication systems; - carry out system maintenance of computer and communication systems; - take part in debugging and technical testing of computer and communication systems; - installation, configuration and configuration

					of the operating system, drivers, resident programs; - to perform the safety procedures. **Possess skills:** - carrying out of control, diagnostics and restoration of working capacity of computer and communication systems; - system engineering services of computer and communication systems; - debugging of hardware-software systems and complexes; - installation, configuration and configuration of the operating system, drivers, resident programs.
9	Object-oriented programming in C++	5	Object-oriented programming in Delphi Operation systems, Fundamentals of component technologies	Microcontrollers and microprocessor systems	**Aim:** In-depth study and development of programming languages based on object-oriented and generalized (using a standard library) programming technology, as the base language is used high-level programming C++. **Content:** Classes. Encapsulation. The design of conventional classes. Reference type. The creation and destruction of objects. Constructors and Destructors. Copy constructor. Hopscotch. Inheritance. The Programming Methods. Override operators (operations). Sorting of arrays. Virtual methods of classes, destructors. Abstract methods and classes. The use of virtual functions. Hopscotch. Encapsulation. Class member. Constructors and destructors. Friends classes. Overloading of operations. Templates. Name space. Expected result: **Know:** - the concept of object-oriented programming, its basic concepts (class, object), properties (encapsulation, inheritance, polymorphism); - method of analysis and design of object-oriented programs; - the basic concepts, the syntax and semantics of the constructs of the programming language C++; - methods of drawing up object-oriented programs in C++programming language; - features of the integrated programming environment in C++. **Able to:** - debug and test programs written in C++; - formulate the problem statement; perform a formalized description of the task, its algorithmization; - based on the existing algorithm to build a computer program in algorithmic languages and C++. **Possess skills:** - object-oriented design; - development of object-oriented software code in modern operating systems.
9	Functional programming	5	Object-oriented programming, Operating systems, environments and shells, Component technologies and	Fundamentals of microprocessor technics	**Aim:** Formation of students ' General methodological foundations and practical skills of developing software systems using a functional approach to programming **Content**: Introduction to functional programming. Introduction to the course. The

			distributed software development		paradigm of functional programming. A comparison of imperative and functional programming. The characteristic features of functional programming. Fundamentals of lambda calculus. Reasons for the use of lambda calculus formalization. The concept of lambda expression. Currying. Free and connected variables, expressions. **Expected result:** **Know:** - features of artificial intelligence problems and the role of functional programming as methodologies for solving these problems; - trends and prospects of functional programming tools development; - fundamentals of lambda calculus theory and practice. **Able to:** - develop software applications for solving the tasks in the functional programming language; - develop algorithms for solving problems for functional programming **Possess skills:** - work with the software application for solving of the tasks in a functional programming language; - development of algorithms for solving problems for functional programming.
10	Setting up, repair, optimization and maintenance of computer systems	5	Application Packages	Microcontrollers and microprocessor systems	**Aim:** Development of professional competences of students necessary for realization of professional activity, formation of abilities and skills on performance of the works connected with maintenance and repair of computer systems and complexes. **Content:** Configuring the computer equipment. Test the hardware with the debugger. Testing of hardware with the help of diagnostic programs. Create bootable media. Determining the parameters of the power supply. Testing the video system. Testing the CPU. Testing the hard drive. Restore the operating system to a healthy state. Keyboard and mouse maintenance. Test ports on the motherboard. Maintenance of the local network. **Expected result:** **Know:** - features monitoring and diagnostic devices hardware and software systems; - main diagnostic methods; - hardware and software functional control and diagnosis of computer systems capabilities and applications of standard and special test equipment to locate the ground fault SWT; - use of service tools and built-in test programs; - hardware and software configuration of computer systems and complexes; - installation, configuration and configuration of the operating system, - drivers, resident programs; methods of ensuring stable operation of computer systems and complexes.

					Able to: - to control, diagnose and restore the performance of computer systems and systems; - to carry out system technical maintenance of computer systems and complexes; - take part in debugging and technical testing of computer systems and systems; - installation, configuration and configuration of the operating system, drivers, resident programs. **Possess skills:** - carrying out of control, diagnostics and restoration of working capacity of computer systems and complexes; - systems engineering computer systems and complexes; - debugging of hardware-software systems and complexes; - installation, configuration and configuration of the operating system, drivers, resident programs.
10	Technics computer and communication systems	5	Introduction to computational informatics	Fundamentals of microprocessor technics	**Aim**: the study of the discipline is the development of professional competencies of students necessary for the implementation of professional activities, the formation of skills and abilities to perform work related to the maintenance and repair of computer systems and complexes. **Contents**: Control and diagnostics of computer systems and complexes. Structure of computer systems and complexes Generalized structure of computer systems and complexes. Hardware of functional control and diagnostics of computer systems and complexes, their application. Software for functional control and diagnostics of computer systems and complexes, their application. **Expected result:** **Know**: - to control, diagnose and restore the performance of computer systems complexes; - carry out system maintenance of computer systems and complexes; - take part in debugging and technical testing of computer systems and complexes, installation, configuration and configuration of the operating system, drivers, resident programs; - comply with safety regulations; **Able to:** - features of control and diagnostics of devices of hardware and software systems; main diagnostic methods; - hardware and software for functional control and diagnostics of computer systems and complexes, possibilities and applications of standard and special control and measuring equipment for localization of fault locations of SVT; - application of service tools and built-in test programs; - hardware and software configuration of computer systems and complexes;

					- installation, configuration and configuration of the operating system, drivers, resident programs, methods of ensuring the stable operation of computer systems and complexes; - rules and norms of labor protection, safety, industrial sanitation and fire protection. **Own skills:** - monitoring, diagnostics and recovery of computer systems and complexes;
11	Automated systems of date processing	5	Information theory	Softwere for working with large data	**Aim**: to Teach future specialists the complex of special knowledge and skills in the field of design and organization of high-performance automated production processes of mechanical Assembly production in mechanical engineering. **Contents**: Introduction. Aspects and fundamental theories of automation of production processes of mechanical engineering. Social, technical and economic aspects of automation. The main stages of automation of production Processes theory of productivity. Sources of progressiveness of automatic systems Theory of reliability of automatic equipment **Expected result:** **Know:** - principles of construction of automatic machine systems and fundamental theories of automation of production processes; - features of automation of Assembly processes; - target mechanisms, machines and automatic lines; **Able to:** - to design separate trust mechanisms machines and avtomatichecki lines; - to design an automatic machine tool systems; - perform calculations of performance and reliability of automatic equipment; Possess skills: - analysis of performance, reliability and economic efficiency of automatic lines; - processing and analysis of statistical information on the reliability, performance and efficiency of automatic systems
11	Database design	5	Information technologies	Processing and analisis of large data	**Aim:** Formation of students ' deep theoretical knowledge in the field of management, data storage and processing, as well as practical skills. **Content:**Introduction to the database. Database technology, basic concepts and definitions. DBMS, architecture of DBMS. Hierarchical, network, and relational data models. Relational systems, classification, client. Stages of database design. **Expected result:** **Know:** - features of the relational model and their impact on database design, visual AIDS used in ER modeling; - basics of relational algebra; principles of database design, ensuring the consistency and integrity of data; design database structures;

					- SQL query language. **Able to:** - design a relational database; - use SQL to programmatically retrieve information from databases. **Possess skills:** - searching and structuring information; modern techniques and technologies for the development and support of technical systems.
12	Computer-modeling	5	Probabilities theory and Math statistics	3D graphics and animation	**Aim:** Development by students of methodology and technology of modeling (first of all computer) at research, design and operation of information systems. **Content:** Basic concepts of system modeling. Tools for modeling systems. Operation of the system. Formalization and algorithmization of processes of functioning of systems. Methods of planning experiments. Modeling of systems using typical machine schemes**.** **Expected result:** **Know:** - main concepts of modeling theory, classification of models and their use, modeling problems; - main modeling tools used in the process of designing systems at different stages of project detail; - methods of modeling and analysis of systems; - principles of construction of models. **Able to:** - perform an analysis of the system or process under study; reasonably choose a modeling method; - to build an adequate model of the system or process using modern computer tools; - to interpret and analyze the simulation results. **Possess skills:** - the main criterion of evaluation of the obtained simulation results; - experience of work and use in simulation of scientific and technical information.
12	Mathematical and computer modeling	5	Discrete Math	Interactive graphic systems	**Aim:** Study the methodology and technology of mathematical and computer simulation in the study, design and operation of computer technology. **Content:** the Concept of models and modeling. Basic methods of simulation. Classification of models. Formulation of the linear programming problem and methods of its solution. Basic concepts of game theory. The formulation of game problems. The models and methods of solving game theory problems. **Expected result:** **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. **Able to:** - use basic numerical methods for solving

					mathematical problems; - to develop algorithms and programs for solving computational problems, taking into account the necessary accuracy of the result; - to select analytical methods for studying mathematical models; - to use numerical methods for studying mathematical models. **Possess skills:** - the solution of computational problems using computer modeling.
12	Computer-modeling	1 (F)	Probabilities theory and Math statistics	3D graphics and animation	**Aim:** Development by students of methodology and technology of modeling (first of all computer) at research, design and operation of information systems. **Content:** Basic concepts of system modeling. Tools for modeling systems. Operation of the system. Formalization and algorithmization of processes of functioning of systems. Methods of planning experiments. Modeling of systems using typical machine schemes**.** **Expected result:** **Know:** - main concepts of modeling theory, classification of models and their use, modeling problems; - main modeling tools used in the process of designing systems at different stages of project detail; - methods of modeling and analysis of systems; - principles of construction of models. **Able to:** - perform an analysis of the system or process under study; reasonably choose a modeling method; - to build an adequate model of the system or process using modern computer tools; - to interpret and analyze the simulation results. **Possess skills:** - the main criterion of evaluation of the obtained simulation results; - experience of work and use in simulation of scientific and technical information.
12	Mathematical and computer modeling	1 (F)	Discrete Math	Interactive graphic systems	**Aim:** Study the methodology and technology of mathematical and computer simulation in the study, design and operation of computer technology. **Content:** the Concept of models and modeling. Basic methods of simulation. Classification of models. Formulation of the linear programming problem and methods of its solution. Basic concepts of game theory. The formulation of game problems. The models and methods of solving game theory problems. **Expected result:** **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. **Able to:**

					- use basic numerical methods for solving mathematical problems; - to develop algorithms and programs for solving computational problems, taking into account the necessary accuracy of the result; - to select analytical methods for studying mathematical models; - to use numerical methods for studying mathematical models. **Possess skills:** - the solution of computational problems using computer modeling.
13	Modern methods and Java software	5	Computer networks and telecommunications	Preparing theses	**Aim:** Development Of methods and tools, as well as the basics of programming for Windows on Java and prepare for their active use in solving problems selected specialties. **Content:** The data structure and operations that apply to them. The control statements. Data entry and output. Arrays. Edit the arrays. Work with files. String manipulation. Treatment of special cases. Object-oriented programming in Java. Properties of the target programming. Packages and interfaces. Graphic primitive. Java integrated environment. Simple Java applications. **Expected result:** **Know:** - types, the characteristics of the data operations, and language operators; - principles of object-oriented programming; - fundamentals of computer networks and associations of networks, the internet, concepts, programming environment Java. **Able to:** - use classes to process applications; - work with files; use the principles of building a graphical interface, graphical primitive; convert applets. **Possess skills:** - work with operators, with arrays of application processing; - create classes, methods, publications, objects; - creating client components and applications; - work with Java network technologies.
13	Modern methods and software NET	5	Technics of computer and communication systems	Preparing theses	**Aim:** Mastering methods and tools, as well as the basics of programming for Windows on NET and preparing for their active use in solving the problems of the selected specialties. **Content:** Basics of computer networks and networking. Internet services. The concept of the world wide web (world wide web). **Expected result:** **Know:** - types, the characteristics of the data operations, and language operators; - principles of object-oriented programming; - basic principles of computer networks and networking, internet services, concepts, programming environment NET. **Able to:** - use classes to process applications; - work with files; use the principles of building

					a graphical interface, graphical primitives; convert applets. **Possess skills:** - work with operators, with arrays of application processing; - create classes, methods, publications, objects; - creating client components and applications; - work with NET network technologies.
14	Softwere for working with large data	5	Aautomated systems of date processing	Software in business	**Aim**: Cloud technologies is to obtain theoretical knowledge and practical skills on solutions based on "cloud" technologies, methods and features of designing "cloud" services, as well as obtaining skills in application development for the main existing "cloud" platforms. **Content**: to study practices to reduce the main risks associated with the use of" cloud "computing, licensing and certification of" cloud " services, compliance with legal rules and regulations in force in the country. Consider the main characteristics of "cloud" technologies; the main differences from solutions based on server technologies; the advantages and risks associated with the use of "cloud" computing, as well as the prerequisites for the transition to "cloud" infrastructure and the use of "cloud" services. Explore existing solutions based on "cloud" technologies, as well as the main providers of "cloud" platforms. Consider the structure of "cloud" services: components and ways of interaction of these components, advantages and disadvantages of these platforms. **Expected result:** **Know:** - use cloud programming techniques; **Able to:** - basic concepts and terminology of cloud technologies and applications of cloud technologies; perform calculations related to the economy of cloud computing; **Possess skills:** - performing software development of cloud systems, system administration for the development and maintenance of applications deployed in the clouds.
14	Processing and analisis of large data	5	Database desing	Fundamentals of Internet Business	**Aim**: Cloud technologies is to obtain theoretical knowledge and practical skills on solutions based on "cloud" technologies, as well as skills in application development for the main existing "cloud" platforms, methods and features of designing "cloud" services, **Content**: to study practices to reduce the main risks associated with the use of" cloud "computing, licensing and certification of" cloud " services, compliance with legal rules and regulations in force in the country. Consider the main characteristics of "cloud" technologies; the main differences from solutions based on server technologies; the advantages and risks associated with the use of "cloud" computing, as well as the prerequisites for the transition to "cloud" infrastructure and the use of "cloud" services.

					Expected result: **Know:** - use cloud programming techniques; **Able to:** - basic concepts and terminology of cloud technologies and applications of cloud technologies; **Possess skills:** - performing software development of cloud systems, system administration for the development and maintenance of applications deployed in the clouds.
15	3D graphics and animation	4	Computer modeliring	Preparing theses	**Aim:** Mastering the knowledge of three-dimensional modeling, creating three-dimensional animation and visual effects. **Content:** Introduction to 3D. User interface with 3D StudioMax and Windows projections. Working with basic objects. Object transformation. Modifiers. Modeling of simple and complex forms. Toning. Animation. Visualization. **Expected result:** **Know:** - EN basic concepts of three-dimensional graphics; - features of 3D Studio max; - principles of creation, modification, texturing and lighting of objects on the subject plane, types of lighting, features of color rendering; - the principles and methods of transmitting motion in animation; - General principles for the development of the project in 3D Studio max; - the steps of creating a project in 3D Studio MAX. **Able to:** - create a fixed three-dimensional scene in accordance with the rules of artistic and technical design taking into account color-package solutions; - to create a simple animated three-dimensional scene using 3D Studio max; - to export and import image files into the 3D Studio MAX; - develop and submit to the defense your project created by the program in 3D Studio MAX. **Possess skills:** create 3D graphics in 3D Studio max, Autodesk 3ds Max, and AutodeskMaya 3d.
15	Interactive graphics systems	4	Mathematical and computer modeling	Preparing theses	**Aim:** Consolidate and expand knowledge in the field of engineering graphics with the help of modern graphics packages. **Content:** Introduction. Two-dimensional images and their transformations. Three-dimensional geometric transformations. The decomposition of the raster in the simplest curves. Illumination models. Methods of painting. A modern graphics system. Introduction to Photoshop. Interface, tools. Mastering the skills of creating professionally-oriented computer geometric models, including architectural ones.

					Expected result: **Know:** - on the basics of two-dimensional, three-dimensional graphics, operations with graphic objects. **Able to:** - practically to use means of computer graphics at designing of products and means of equipment of technological processes; - perform operations on graphical objects. **Possess skills:** - basic techniques for the creation, conversion and editing of multimedia data; - enterprises multimedia information in a single information field; use of techniques for creating three-dimensional computer graphics to correctly apply them in future professional activities.
MAJORS					
Be sure to select (MSS)					
1	Fundamentals of component technologies	3	Computer networks and telecommunications	Object-oriented programming in C++	**Aim:** Training in modern methods and means of component programming. **Content:** Extensions to the C++ language environment C++ Builder. Additional types of data. Additional scopes. Model PME. Properties. **Expected result:** **Know:** - basic concepts of technology of component-oriented programming; - mechanisms for the implementation of the technology component programming in the library of visual components VCL; - the principles of event-driven programming; - technology user interface design of applications using a component library VCL; - the hierarchy of base class library of visual components VCL, their properties and methods; - purpose, properties, methods, usage characteristics, components, general purpose; - ways of organizing the application's user interface. **Able to:** - to analyze a subject area and choose the library classes required for the solution of applied problems; - to use the tools of the integrated development environment of C++ Builder for visual development of applications. **Possess skills:** - development of user interfaces of applications based on generic and specialized components, library, VCL; - the implementation of the application with different user interface types.
1	Component technologies and distributed software development	3	Technics of computer and communications sys	Object-oriented programming in C++	**Aim:** Acquaintance with the concepts of distributed information system, distributed information processing, as well as the principles and problems of this subject area. **Content:** Main mechanisms of distributed object technologies. The problem of integration

					in distributed applications. Internet technologies when creating distributed applications. **Expected result:** **Know:** - main types of distributed applications; - modern development technologies and development of distributed applications; - main distributed object technologies and architectures (service-oriented architecture, component architecture, agent architecture, CORBA architecture). **Able to:** - develop distributed applications using socket technologies, remote procedure calls, component models, CORBA, web services; - select the development technology based on the specifics of the application. **Possess skills:** - development of distributed applications of different types; - the use of object-oriented programming in distributed systems.
2	Information security and information safety	5	Probabilities theory and Math statistics	Technologies of distributed systems	**Aim:** Formation of students ' knowledge system in the field of information security and practical application of methods of information security. **Content:** Information security of computing systems, a multilevel protection of corporate networks; protection of information in networks; the requirements of the information security systems **Expected result:** **Know:** - about protection of information of computer systems, the main subsystems of the computer, which cover concepts such as system highways, internal and external memory; - requirements for information security systems; - on the protection of corporate networks, the principles of security of information processing systems; - main characteristics of cryptographic methods of information protection. **Able to:** - in practice, to use means of information protection against unauthorized access and destructive software actions. **Possess skills:** - access to electronic information resources, databases, libraries, archives; - adaptation information resources and information technology; - work with documents containing restricted information.
2	Data protection	5	Discreate Math	Technologies of development of distributed information systems	**Aim:** Formation of students ' knowledge system in the field of information security and practical application of methods of information security. **Content:** Information security of computing systems, a multilevel protection of corporate networks; protection of information in networks; the requirements of the information

					security systems **Expected result:** **Know:** - about protection of information of computer systems, the main subsystems of the computer, which cover concepts such as system highways, internal and external memory; - requirements for information security systems; - on the protection of corporate networks, the principles of security of information processing systems; - main characteristics of cryptographic methods of information protection. **Able to:** - in practice, to use means of information protection against unauthorized access and destructive software actions. **Possess skills:** - access to electronic information resources, databases, libraries, archives; - adaptation information resources and information technology; - work with documents containing restricted information.
3	Microcontrollers and microprocessor systems	5	Setting up, repair, optimization and maintenance of computer systems, Object-oriented programming in C++	Programming technologies on the Internet, Software development technology	**Aim:** Teaching students the principles of construction, functionality and architectural solutions of modern microprocessor systems (MPs), microcontrollers (MC) and personal computers, as well as the development of techniques for designing microprocessor systems. **Content:** Basics of organization and design of microprocessor systems (MPs). Architecture of microprocessors, ICS and microcontrollers (MC). Management of peripheral equipment in IPU. Data processing, management. The organization of interfaces in MPs and MK. Design of MPs Expected result: **Know:** - program-logic model of microprocessor 1810BM86; - modes of operation of the microprocessor 1810 BM86; - principles of construction of microprocessor systems; - program-logic model MCU series 1816; - modes of operation of micro-computer 1816 WE48; - features of the organization of system interrupts microprocessor and microcontroller 1810BM86 1816BE48; - organization of memory of 1816 series microcontrollers**.** **Able to:** - to build microprocessor systems on the basis of sets of 1816 and 1810; - to test the microprocessors in computers **Possess skills:** - composing electronic circuits for the operation of microprocessors and how to incorporate

3	Fundamentals of microprocessor technics	5	Maintenance and repair of computer systems and complexes,Functional programming	Design of Distributed Control Systems Software development process	**Aim:** Familiarize students with the classification of microprocessor systems (MPs), basic architectures of MPs, functional units and the principle of the processor, by studying the architecture, command systems, the order of work with the main peripherals and subsystems of a particular single-chip RISC microcontroller, to consolidate the basic theoretical provisions **Content:** Overview of MK families AVR. The basics of programming in assembler, AVR MC. Familiarity with peripheral devices in the MC AVR. **Expected result:** **Know:** - principles of construction of electronic devices on the basis of modern element base and MPs; - principles of functioning of electronic devices on the basis of modern element base and MPs; - main technical parameters, performance characteristics and application fields of the main devices and functional units of electronics and MPs; - the basic principles of designing circuits on the basis of the IPU. **Able to:** - to perform the design and calculation of standard units of MEAs; - to make a choice of MPs to the required task. **Possess skills:** - perform analysis and synthesis of electronic circuits with MPs; - of design and analysis of electronic devices with the help of computers.
4	Artificial intelligence systems	5	Application Packages	Programming technologies on the Internet	**Aim:** Formation of the system of the base view, the primary knowledge, abilities and skills of students in fundamentals of engineering and neuroinformatics. **Content:** History of artificial intelligence. Concepts of applied systems of artificial intelligence. The logic of predicates of first order. Semantic network. **Expected result:** **Know:** - main theoretical and practical skills of system programming at the level of program development, allowing to obtain modern programs of complex logical structure at the lowest cost; - about the composition and principles of PC management systems and networks; the appointment of components of the operating system; the principles of functioning of the various elements of the operating systems interaction; - generation and processing of processes in the system; - main methods and principles of programming in modern operating systems; - main concepts such as: kernel objects, processes, threads, priorities, security attributes, heaps, mutexes, semaphores.

					Able to: - to develop programs: covering issues of system software. **Possess skills:** - skills of working with different operating systems and their administration; - languages procedural and object-oriented programming, skills development and debugging of programs by no less than one of algorithmic procedural programming languages of high level.
4	Intelligent animation	5	Inproduction to computer scince	Technologies of distributed systems	**Aim:** Formation of the system of the base view, the primary knowledge, abilities and skills of students in fundamentals of engineering and neuroinformatics. **Content:** History of artificial intelligence. Concepts of applied systems of artificial intelligence. Animation. The types of animation. Intelligent animation. The creation of short films. **Expected result:** **Know:** - history of artificial intelligence. - about applied systems of artificial intelligence. - all kinds of animation. **Able to:** - navigate in different types of intelligent systems; - to navigate and the various knowledge representation methods, to go from one method to another; - formalize the knowledge of experts using different methods of knowledge presentation; - create short films. **Possess skills:** - the development of production knowledge bases for solving the problem of choice of options in poorly formalized subject area; - applications of basic neural network models.
5	Software in business	5	Softwere for working with large data	Preparing theses	**Aim:** Form an understanding of the process of creating a viable startup among students - potential entrepreneurs, practical skills in the field of Internet project management and the development of small businesses in the Internet segment. **Content:**Types of technology businesses and Internet businesses. Development stages of a startup. Technological entrepreneurship. Business model. Marketing communications. Statement of sales. PR startup. **Expected result:** **Know:** - the basic concepts of automated data processing in business processes; - general composition and structure of personal computers and computing systems; - composition, functions and possibilities of using information and telecommunication technologies in business; - methods and means of gathering, processing, storage, transmission and accumulation of information;

					- underlying system software products and packages of applied programs in the field of professional activities; - main methods and techniques of information security. **Able to:** - to use technology for the collection, distribution, storage, accumulation, conversion and transmission of data in a professionally oriented information systems; - use various types of software, including special software, in professional activities.; to use computer and telecommunication resources. **Possess skills:** - technology for the collection, distribution, storage, accumulation, conversion and transmission of data in a professionally oriented information systems.
5	Fundamentals of Internet Business	5	Processing and analisis large date	Preparing theses	**Aim:** Familiarize students with the models and tools of entrepreneurs in relation to enterprises operating in the Internet sphere. **Content:** Introductory motivational lecture: technological entrepreneurship. Business model. Marketing communications. Statement of sales. PR startup. **Expected result:** **Know:** - practice of organization of work of the enterprise in the online sphere; - specific features of consumer behavior and marketing aspects of Internet entrepreneurship; - market research and analysis tools; - main business models of companies working in the Internet sphere. **Able to:** - conduct a business activity in companies of high-tech sectors; - to develop and implement the business model. **Possess skills:** - the use of methods, techniques, tools to create an Internet company; - planning and assessing the business activities in the Internet sphere.
6	Programming technologies on the Internet	3	Microcontrollers and microprocessor systems, Artificial intelligence systems	Preparing theses	**Aim:** Formation of students ' knowledge about programming Internet applications for business, mastering the basic capabilities of HTML, JavaScript and PHP languages for programming websites and web interfaces. **Content:** Design and creation of a modern web-site. Web-design and browsers. The hypertext markup language HTML pages. Making a Web page available. Presentation of text on Web pages. The representation of graphics on Web pages. Web server. Create fixed and flexible Web pages. MacromediaFlash. The strategy of development of the Web site **Expected result:** **Know:** - basic principles and technologies of the global Internet computer network organization;

					- fundamentals of construction and operation of Internet application services; - main technologies of applied programming for the Internet. **Able to:** - to determine the section of the network with the maximum transmission delay of IP packets; - to form HTTP requests and parse the fields in the HTTP response; - develop hypertext documents. **Possess skills:** - methods and development of web applications using hypertext markup languages HTML and XHTML, cascading style sheets CSS, JavaScript, PHP; - methods of organization of local computer networks; - technologies to protect Internet applications from the point of view of information security.
6	Design of Distributed Control Systems	3	Fundamentals of microprocessor technics, Intelligent animation	Preparing theses	**Aim:** Development of the concept and methodology of analysis and synthesis of complex systems, design principles of information systems **Content:** Phases and stages of designing SU. Sketch design. Analysis and synthesis of data processing systems. Synthesis and analysis of the control system. Measures to assess the quality of the designed system. Synthesis of XOIU. **Expected result:** **Know:** - properties, characteristics and architecture (structure and topology) of distributed control and automation systems (DCS), - types of support {methodical, technical, software, informational, metrological, ergonomic, organizational and legal); - functional objectives and performance criteria of DCS. **Able to:** - to carry out projects of means of automation, systems of automation of technological processes: - perform automation of research and testing: - design and implement algorithms for preprocessing information (compression, filtering, improving the accuracy of conversion, etc.).), - Build modern control algorithms (modal, neuro-fuzzy, network - centric, etc.). - to determine the section of the network with the maximum transmission delay of IP packets; - to form HTTP requests and parse the fields in the HTTP response; - develop hypertext documents. **Possess skills:** - implementation of formal construction and transformation of analytical and simulation models of DCS; - the application of methods and techniques

					for the analysis and synthesis of RSU architectures; - development and use of analytical and simulation models of DCS for evaluation of design solutions; - implementation of the sequence of design stages of control and automation systems.
7	Programming on PHP	5	Programming languages and technologies	Preparing theses	**Aim**: currently, - 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. **Expected result:** **Know:** - principles of Internet services; **Able to:** - create static and dynamic pages. **Possess skills:** - programming and client-server technologies.
7	Web programming	5	Programming languages	Preparing theses	**Aim**: the Discipline "Web-programming" aims to learn the basics of Java programming and basic concepts that allow students to get a basic understanding of effective ways to develop Web applications, along with the acquisition of practical skills **Contents**: introductory lecture. The subject of the course, the emergence and development of Java. Java virtual machine. Algorithmic tools of the Java language. Vocabulary of the language. Data type. Operations. Control structures. Naming rules. Packages. Objects and classes. **Expected result:** **Know:** - static web-site development technologies; - methods of using multimedia (graphics, video, animation) on web-pages; - client-side software tools used to create web pages; **Able to:** - design and develop the structure of the site; - use HTML hypertext markup language and cascading style sheets (CSS) to create web pages; - develop scripts in the JavaScript programming language; **Possess skills:** - creation of web-sites; - placement of the web-site on the server and its maintenance; - registration of the site in search engines.

8	Technologies of distributed systems	5	Softwere for working with large data, Information security and information safety	Preparing theses	**Aim:** Reveal the essence of distributed computing technology, principles and technology of distributed databases, to describe the technologies and models of "Client-server" used in modern enterprises **Content:** Distributed computing Technologies. Distributed database. Client-server technologies and models». Object data binding technologies. Data replication technologies **Expected result:** **Know:** - principles of distributed information processing systems construction; - distribution database; - Client-server network technology and models»; - technology object data binding. **Able to:** - to use technology in development and maintenance of distributed information systems. **Possess skills:** works with modern systems of design and development of distributed systems.
8	Technologies of development of distributed information systems	5	Data protection, Processing and analisis of large data	Preparing theses	**Aim:** Theoretical and practical training of students in the field of information technology to the extent that they can choose the necessary technical, algorithmic, software and technological solutions, Able to explain the principles of their operation and use them correctly. **Content:** Communication in distributed systems. Remote procedure call. Safety. Link type. Distributed transaction. The notion of a transaction. The ACID principle. Nested transaction. Distributed transaction. **Expected result:** **Know:** - principles of distributed information processing systems construction; - communication in distributed systems; - link type; - the notion of a transaction. **Able to:** - to use technologies of construction and operation of the distributed information systems. **Possess skills:** - works with modern systems of design and development of distributed systems
9	Software development technology	6	Microcontrollers and microprocessor systems	Preparing theses	**Aim:** Study of software classification, tools and methods of software tools, tools and methods of detection, processing tools and compilation, download, installation of software characteristics of devices, their information support, support and implementation of software, the practical application of modern processing tools. **Content:** Introduction. State and foreign normative documents, determination of treatment composition. RUP. Processing of applications. DC. The tools and techniques of logical design. UML. Description of processing

					functionality. The tools and techniques. Create a cluster diagram. Methods, technologies, tools. Define language processing, determine the propagation medium and determine the processing tools. Physical design procedure-order, tool, resource, documentation Tools for visual programming with MS VisualStudio, BorlandDelphi and others. Selection and editing of components, machining of components. Open the API TOOL. The repair software. Tooling. Repair method. Testing. Variants and examples of tests. Selection and editing of components, machining of components. Open the API TOOL. The creation of a software interface. The principles of processing tool. Methods for creating interfaces and tools. Optimize processing time and size. The tools and techniques. Create help. The tools and techniques. Principles of software development and protection. Principles of software development. **Expected result:** **Know:** - modern trends in computer science, computer technology; - basis of creation of information systems and use of new information technologies of information processing; - life cycle of the software; object-oriented programming; - theories and methods of classification; - elements of complexity theory. **Able to:** - use mathematical methods, physical laws and computational techniques to solve practical problems; - program in one of algorithmic languages; - to apply algorithms of information retrieval IN software development. **Possess skills:** - drafting of projects for the development of modern software; - technologies of data collection, processing, transmission and storage.
9	Software development process	6	Fundamentals of microprocessor technics	Preparing theses	**Aim:** Study the classification, life cycle, technology rapid software development. **Content:** Life cycle of the software. Identification of requirements for the software system. Work with customers. Review of software design methodologies. Fast software development technologies. Object-oriented design of a software system. Information support tools for software projects and products (CALS) technologies. Testing and debugging of software systems. Assessment of the quality of the software. Implementation and maintenance of software products **Expected result:** **Know:** - theoretical basis of software tools; - classical and modern methods of building the information structure and interface of the tool. **Able to:**

					- select tools when creating software; - to apply the standards of construction of the software; - to assess the effectiveness of tools and the analysis of qualitative characteristics; - realize the economic efficiency of the software; - to apply object-oriented and structured methods of distribution in control and measuring instruments. **Possess skills:** - software development hard; comparative analysis of selection tools.

LIST OF COMPONENTS BY CHOICE
for an educational program

«6B06124 «Computational technology and software»
Form of training: Full-time 4 years

Group of educational program: 5B057- Information technologies

Name of the discipline	discipline code	Credits	Semester
Comprehensive Disciplines			
Component on a choice 1			**2**
Module of economic and legal knowledge		5	
Fundamentals of market economy and entrepreneurship	FMEES 1111	3	
Fundamentals of law and anti-corruption culture	FLACC 1112	2	
Component on a choice 2			2
Module of economic and natural knowledge		5	
Fundamentals of market economy and entrepreneurship	FMEES1111	3	
Fundamentals of safety and life	FSAL1112	2	
Basic disciplines			
Component on a choice 1			3
Introduction in specialty	IS 1209	5	
Basics of work on a personal computer	BWPC 1209	5	
Component on a choice 2			3
Application Packages	AP 1210	5	
Introduction to Computational Mathematics	ICM 1210	5	
Component on a choice 3			4
Information theory	IT 2211	5	
Information technologies	IT 2211	5	
Component on a choice 4			4
Object-oriented programming Delphi	OOPD 2212	3	
Object-oriented programming	OOP 2212	3	
Component on a choice 5			5
Probabilities theory and Math statistics	PTMS 2213	5	
Discrete Math	DM 2213	5	
Component on a choice 6			5
Operating systems	OS 2214	5	
Operating systems, environments and shells	OSES 2214	5	
Component on a choice 7			6
Programming languages and technologies	PLT 2215	5	
Programming languages	PL 2215	5	
Component on a choice 8			6
Computer networks and telecommunications	CNT 2216	5	

Technics of computer and communication systems	TCCS 2216	5	
Component on a choice 9			6
Object-oriented programming in C++	OOPC 2217	5	
Functional programming	FP 2217	5	
Component on a choice 10			7
Setting up, repair, optimization and maintenance of computer systems	SROMCS 3218	5	
Maintenance and repair of computer systems and complexes	MRCSC 3218	5	
Component on a choice 11			7
Aautomated systems of date processing	ASDP 3219	5	
Database design	DD 3219	5	
Component on a choice 12			7
Computer modeling	CM 3220	5	
Mathematical and computer modeling	MCM 3220	5	
Component on a choice 13			7
Modern methods and means of Java programing	MMMJP 3221	5	
Modern methods and means of NET programing	MMMNP 3221	5	
Component on a choice 14			8
Softwere for working with large data	SWLD 3222	4	
Processing and analisis of large data	PALD 3222	4	
Component on a choice 15			8
3D graphics and animation	3DGA 3223	4	
Interactive graphic systems	IGS 3223	4	
Profiling Discipline			
Component on a choice 1			4
Fundamentals of component technologies	FCT 3303	3	
Component technologies and distributed software development	CTDSD 3303	3	
Component on a choice 2			5
Information security and information safety	ISIS 3304	5	
Information security	IS 3304	5	
Component on a choice 3			5
Microcontrollers and microprocessor systems	MMS 3305	5	
Fundamentals of microprocessor technics	FMT 3305	5	
Component on a choice 4			6
Artificial intelligence systems	AIS 3306	5	
Intelligent animation	IA 3306	5	
Component on a choice 5			6
Software in business	SB 4307	5	
Fundamentals of Internet Business	FIB 4307	5	
Component on a choice 6			6
Programming technologies on the Internet	PTI 4308	3	
Design of Distributed Control Systems	DDCS 4308	3	
Component on a choice 7			7
Programming on PHP	PPHP 4309	5	
Web programming	WP 4309	5	
Component on a choice 8			7
Technologies of distributed systems	TDS 4310	5	
Technologies of development of distributed information systems	TDDIS 4310	5	
Component on a choice 9			8
Software development technology	SDT 4311	6	
Software development process	SDP 4311	6	