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Казахский гуманитарно-юридический инновационный университет
Kazakh Humanitarian and Legal Innovative University

Ақпараттық технологиялар және экономика факультеті
Факультет информационных технологий и экономики
Faculty of Information Technology and Economics

«Информатика және математика» кафедрасы
Кафедра «Информатики и математики»
Department«Informatics and Mathematics»

5В060200 «Информатика»
5В060200«Информатика»
5В060200 «Informatics»

ЭЛЕКТИВТІ ПӘНДЕР КАТАЛОГЫ
КАТАЛОГ ЭЛЕКТИВНЫХ ДИСЦИПЛИН
CATALOGUE OF THE ELECTIVE COURSES

Түскен жылы - 2018
Год поступления - 2018
Year of admission-2018

Семей, 2018 жыл
Семей, 2018 год
Semey, 2018

Elective course №	Discipline	Number of credits		Prerequisites	Postrequisites	Brief description indicating the purpose of the study, an outline and expected learning outcomes (knowledge, skills, competence)
		RK	ECTS			
GENERAL EDUCATIONAL DISCIPLINES						
Elective courses (EC)						
1	Ecology with the basics of life safety	2	3	School Basics course		**Aim**:to create a holistic representation of the basic laws of sustainable development of nature and society. **Contents:**of Study of basic regularities of interactionin the system "biosphere – society - technological environment" and the formation of ideas about economic approaches to solving environmental problems. **Expected result:** Preparation of environmentally literate specialists who are actively involved in pressah the preservation and restoration of the environment
1	Psychology	2	3	School course "Self-knowledge"		**Aim** formation of a holistic view of psychological science and modernity. **Content:** Psychology-an objective inner world of man, mediating its interaction with the outside world. It is characterized by a form of active reflection of the subject of objective reality, occurs in highly organized living beings in the process of interaction with the outside world and carries out their behavior regulatory function. This is the highest form of the relationship of living beings with the objective world, expressed in their ability to realize their motives and act on the basis of the information received about the world. **Expected result:** to Know: the Essence of the basic psychological processes and properties, mental States that provide a person with his life; the basic methods of psychology and be able to use them in practice, taking into account its economic specifics; psychological theories of personality,group and team. Be able to: use the knowledge of p psychology in their practice; organize individual and group activities of people taking into account their psychological characteristics and compatibility; competently use communicative competence in the process of group joint activities. Possess skills: techniques of memory development, thinking, analysis and generalization
2	Political Science	2	3	Modern history of Kazakhstan		**Aim**: the political Science course gives the student the necessary minimum knowledge of political realities, norms of political behavior, political values, teaches to operate a modern internationally recognized categorical and conceptual apparatus, develops the ability to critically analyze and predict the political situation, develops interest and respect for

						national traditions, promotes cooperation between Nations. The acquisition of such knowledge and focused teaching of political science as a compulsory subject. **Content:** political Science is a branch of knowledge about politics in all its manifestations and interrelations with other areas of social life. Political science studies the relations of different social, ethnic, religious and other groups about government, political institutions and especially the state and the party, political consciousness and culture, and political subjects: identity, elites, leaders, nation, state, etc. of domestic and interstate political processes. **Expected result:** to know: * the subject and objectives of the course; * the main content of the course " political science"; * to master the fundamental knowledge of political theory; * the range of achievements of historical thought in the study of ancient culture. To be able: * to work independently with the literature of General humanitarian character, to be able to find key world Outlook problems and their solutions; * logically, systemically and critically to think; * to use the received Luggage of philosophical erudition for formulation and the proof of own judgments on various questions of daily. Possess skills: General education.
2	Sociology	2	3	School course " Man and society»		**Aim** to Create a view of the students about society, systems, components of it, the regularities of functioning and development of social institutions. **Contents:** Sociology (from lat. societas-Greek society. λόγος — science) is the science of society, systems, components of it, the regularities of its functioning and development, social institutions, relationships, and communities. Sociology is studying a society, revealing the internal mechanisms of the formation and evolution of its structure **Expected result:** to Know: the laws of development and functioning of society; - features of the analysis of the modern system of social inequality, social mobility and stratification; to possess: practical skills of independent analysis of the current state of society. - to use in cognitive and professional activities basic knowledge in the field of Humanities and economic Sciences to be Able to: relate the knowledge of the basics of sociology with professional activities; own: practical skills of applying the knowledge gained in the analysis of real social situations.Possess skills: General education
2	Culturology	2	3	Modern history of Kazakhstan		**Aim:**: the Main goal of the course is the idea of cultural studies as an integral expression of the Humanities. The teaching of the course "cultural studies" should take into account that it is an independent and specific area of human culture, a "living system" included in the modern socio - cultural context. **Contents:** cultural Studies " is associated with a cycle of social and humanitarian disciplines:

						history, political science, philosophy, sociology. Culturology carries out the functions of cognition of the world **Expected result:** Know: - structure and composition of modern cultural knowledge; - cultural studies and philosophy of culture; - sociology of culture, cultural anthropology; - cultural studies and history of culture; Be able to: distinguish between the basic concepts of cultural studies: the dynamics of culture, language and symbols of culture, cultural codes, intercultural communication, cultural values and norms, cultural traditions, cultural picture of the world, social institutions of culture
2	Basics of anticorruption culture	2	3	Modern history of Kazakhstan	Phylosophy	**Aim**: create a professional culture, to improve the image, optimizing the interaction with the environment and in our culture, co-vershenstvovanie management structure, ie, sustainable development in the context of modern changes. **Contents:**set of basic moral - ethical-ing norms and rules of social behavior, after-blowing that we strengthen the culture of high reputation, maintaining its reputation and tradition. **Expected result:** of the study: After the study of this discipline, students should: To know: the concept of the controls are anti-corruption culture. Skills: Identify a set of basic moral and ethical standards. Skills: Work with the normative documents. Competence in the field of economic knowledge
3	Religious	3	5	Phylosophy	All disciplines studied in the specialty that form the worldview of the person	**Aim**: development of tolerance to the traditions and culture of other nations **Contents:**Components of religion as a subject, the concept of religion, religion and ritual, religion and mythology, religion and magic, religion and mysticism, religion and spirituality, the concept of religious experience, religion and faith, religion and its role in society, religion, national and world Expected results of the study: after studying this discipline, students should acquire the following skills and abilities: -Know the specific features of the subject of religion, signs of religious faith, structure and specificity of religious consciousness, - to recognize the signs of religious faith, to allocate animism as the main feature of religion, to distinguish between the basic creed, possess the basic concepts of religion, to be competent in the field of religious studies
BASIC DISCIPLINES						
Elective courses (EC)						

1	Computer architecture	2	3	School informatics	Computer software	**Aim**: of the course is to introduce the basic concepts of modern architecture of a personal computer (PC), acquaintance with the device of the most important hardware components, PC, mechanisms of delivery and information management, the basic rules of logic design. **Contents:**of study of the discipline "computer architecture" is the following concepts: the history of the development of computer technology, computer generation and their classification; central and peripheral devices of computers and their characteristics; channel and bus systems engineering; microprocessor and memory **Expected result:** Students get knowledge of computer hardware and its performance and functionality.
1	Techies of computer and communication systems	2	3	School informatics	Computer software	**Aim:** familiarity with the basic concepts of modern personal computer (PC) architecture,, familiarity with the device of the most important components of PC hardware **Content:** Methods of organization and types of aircraft; parallel information processing: levels and methods of organization; implementation in multi-machine and multi-processor aircraft; operational pipelines; vector, matrix, associative systems; homogeneous systems and environments; RISC-architecture; development of architectures focused on language tools and programming environment; fundamentals of metric theory of aircraft; technology of distributed data processing; principles of construction and architecture of computer networks; protocols, hierarchy of protocols and modes of their operation: connection, data transmission,; transmission of information in computer networks; communication channels, modems; coding and error protection; packet structure; methods of switching channels, messages, packets; routing; basic means of data transmission; local area networks (LAN). **Expected result:** students gain knowledge about the hardware of the computer and its technical characteristics and functionality**.**
2	Analytic geometry and linear algebra	3	5	School mathematics, Geometry	Discrete mathematics	**Aim:** acquisition of theoretical knowledge and problem solving skills in these areas; the acquisition by students of mathematical culture of rigorous reasoning and evidence. **Contents:** algebra of linear operators, theory of bilinear and quadratic forms, classification of surfaces of second order in nite dimensional Euclidean spaces **Expected result:** Knowledge: mastering the basics of polynomial algebra, algebra of linear operators, the theory of bilinear and quadratic forms, classification of second-order surfaces in a finite-dimensional Euclidean spaces
2	Calculation methods and computational practice	3	5	School mathematics, Geometry	Discrete mathematics	**Aim** In connection with the emergence of new methods for the theoretical study of complex processes that allow a mathematical description, a computational experiment, that is, the study of natural-scientific problems by means of computational mathematics, the role of the discipline "Numerical Methods" has significantly increased.

						Contents: The common for all methods of calculation is to reduce the mathematical problem to a finite-dimensional one. This is most often achieved by discretization of the original problem, i.e. Transition from functions of a continuous argument to functions of a discrete argument. **Expected result:** Knows basic methods of programming Delphi, in Visual Basic. Skills: Can independently program in Delphi, in Visual Basic, to use graphic packages. Skills: Has skills in working with the Delphi programming environment, with MahtCad, MatLab graphics packages.
3	Application packages program	3	5	School informatics	Computer software	**Aim**: of teaching is: to teach the knowledge and skills to use modern software **Contents:**Word processing system. Computer graphics system. Databases and database management systems. Understanding of the language of relational database management. Tabular processors. Integrated software tools. Application software user. Own development environment. Workstation. Application toolkit for solving mathematical problems on a computer. Review of symbolic computation packages (Matematica, Derive, Maple V, MathCAD). Technology training mathematical and natural-scientific texts. Packages of statistical information. Graphics packages. Computer-aided design packages. Computer viruses and methods to combat them **Expected result:** of the development of the discipline the student should: Know the classification system and application software; theoretical foundations of computer software; purpose and capabilities of the basic and applied computer software
3	Applied Software	3	5	School informatics	Computer software	**Aim**: the purpose of mastering the discipline "Application software" is to form a holistic view of the principles of construction and operation of modern operating systems; the place and role of modern technologies in solving applied problems using a computer. **Content:** methods of setting and solving scientific and practical problems on computers, methods and techniques of working with hardware and software of computer technology. Knowledge of programming allows the future specialist to navigate freely in the sea of information, work with databases. **Expected result:** Know the classification of system and application software; theoretical foundations of application software; purpose and capabilities of the basic and applied computer software.
4	System programming	4	6	Languages and technologies of programming	Ttheory of programming languages and methods of translation	**Aim**: Education compiling programs using high-performance features BIOS and operating system. **Contents:**Basic Input Output (BIOS). Programming in Windows. Assembly language To develop practical skills to use their

						knowledge
4	System software	4	6	Languages and technologies of programming	Ttheory of programming languages and methods of translation	**Aim :** - mastering by students of theoretical bases of construction and use of system software: operating systems, operating environments, programming systems and file systems; Studying the mechanisms for managing tasks, memory in the OS, ways of exchanging data between processes, flows, mastering the principles of building OS interfaces. **Contents:** Introduction. Definition of the term "system software", the composition of the system software and the content of the course. Operating systems and environments. Interfaces of operating systems. Managing tasks and memory in operating systems. Planning and dispatching processes and tasks: planning strategies, scheduling disciplines, dispatching tasks using dynamic. Priorities. Multitasking and multithreading in Windows. **Expected result:** Memory and display, virtual address space. Segmented, page and segment-page memory organization. I / O management and file systems. Development of practical skills for applying the knowledge acquired
5	World informational resources	3	5	Information and communication technology	Programming in Internet, Multimedia technologies	**Aim**: "World Informational Resources" aims to make acquaintance with the principles of working with global information resources and their development trends, to teach students the principles of the design of search engines, the analysis of the results obtained, the application of modern information technologies in professional work. **Contents:**Basic concepts: the Internet. Internet protocols and standardization. The object model browser. Access to databases using technology WWW. Programming tools on the Internet. Markup Languages. System programming languages Java. Basic language constructs. Class Library language Java. Scripting languages. **Expected result:** Students with knowledge of computer networks, programs, browsers and their technical characteristics and functionality
5	World informational systems	3	5	Information and communication technology	Multimedia software, Programming technology	**Aim**: the purpose of the discipline is to acquaint students with the basics of modern computer systems, information networks and telecommunications. Contents: Basics of building modern computing systems, local and global information networks, architecture of modern personal computers and workstations, with the principle of operation and characteristics of devices used in networks. Expected result: students gain knowledge about computer networks, browser programs and their technical characteristics and functionality

6	Computing modelling	3	5	Information and communication technology	3D graphics and animation	**Aim**: of the course - to expand the students' modeling as a method of scientific knowledge, to introduce the use of the computer as a means of learning and research activities. **Contents:**At present, the simulation is an integral part of modern fundamental and applied science, and most important it is approaching the traditional experimental and theoretical methods. **Expected result:** To develop practical skills to apply this knowledge
6	Matematical and computer modeling	3	5	Information and communication technology	3D graphics and animation	**Aim**: to expand students ' understanding of modeling as a method of scientific knowledge, to introduce the use of computer as a means of knowledge and research activities **Contents:** Modeling as a method of knowledge. Information model. The most important concepts associated with mathematical modeling. Technology of mathematical modeling and its stages. Modeling of physical processes. The motion of objects in the environment taking into account friction. Simulation of motion of celestial bodies and charged particles. Oscillatory process. Description of physical processes in the continuous medium approximation **Expected result:** Development of practical skills in applying theoretical knowledge
7	Theory of languages and automata	3	5	Algorithms and data structures, Languages and technology of programming	Theory of programming languages and translation methods	**Aim:**analyzed in detail the similarities and differences between natural languages and information and ways of construction of information of different types of languages and grammars. Basic concepts of the theory of algorithms and theory of formal grammars. **Contents:**Recursive functions, primitive recursion and minimizatsii.Opisanie Turing machines, methods of presentation, operations on Turing machines. Algorithmically unsolvable problems of the theory of algorithms, the basic concepts of formal grammars and languages. Classification of grammars, parsing strategy and the equivalent conversion COP grammatik.Razlichnye types of machines (finite automata, pushdown automaton, automata, Mealy and Moore) and their relationship to grammars and yazykami.Razlichat translators, having skills in them. Solve logic problems in the environment Turbo prolog **Expected result:** Automata theory is closely connected with the theory of algorithms: machine transforms discrete information in steps at discrete points in time and forms the result of steps of the given algorithm.
7	Algorithmic languages and programming	3	5	Algorithms and data structures, Languages and technology of programming	Theory of programming languages and translation methods	**Aim:** The purpose of discipline is to develop the students' scientific, creative approach to the development of technologies, methods and tools for software production **Content:** The course focuses on the study of high-level programming techniques. Considered routine tasks, and typical examples of programming practice. Solution computing tasks and objectives

						programmirovaniya. **Expected result:** result of study of discipline a student must acquire skills compilation, debugging and testing programs as well as the development and use of interface objects.
8	Computer Software	3	5	Application packages program, Computer architecture	Programming in VBA, Object-oriented programming	**Aim**: of development of the discipline "Computer Software" is a holistic understanding of the principles of construction and operation of modern operating systems; the place and role of modern technologies in solving applied problems using a computer. **Contents:**of the course is to teach students methods of formulating and solving scientific and practical problems on computers, techniques and methods of work with the hardware and software of computer technology. Knowledge of programming allows future specialist freely navigate the sea of information, to work with databases. **Expected result:** of the development of the discipline the student should: Know the classification system and application software; theoretical foundations of computer software; purpose and capabilities of the basic and applied computer software.
8	Practices on the electronic computer	3	5	Application packages program, Computer architecture	Programming in VBA, Object-oriented programming	**Aim:** the Objectives of the development of the discipline is to develop a holistic view of the principles of construction and functioning of modern operating systems; the place and role of modern technologies in the solution of applied problems using the computer. **Content:** Software products; production process: methods, technology and tools; testing and debugging; documentation; software design; abstract data structures; methods of effective storage and processing; technological cycle of software systems development; collective work on software development. **Expected result:** as a result of the development of the discipline, the student must be able to use the knowledge of system and application software in professional activities.
9	Art Programming	3	5	Algorithms and Data Structures	Object-Oriented Programming	**Aim**: The purpose of teaching to familiarize students with the basic methods and programming languages, as well as the main algorithms solutions have become traditional in the course of computer tasks. **Contents:**The main purpose of the special course - to give students the skills of drawing up algorithms and programs by different methods. Requirements to modern technology software. Software life cycle Definition of the input and output documents Functional programming capabilities Partition tasks into modules. programming style Reliable methods of programming. Familiarity with object-oriented programming Management structures of the programming language Delphi. Search the minimum and maximum element

						Expected result: A study of the course the student should: generate programming skills; develop creative thinking, the ability to express his plan with the help of the program. master the basic principles of drawing and the use of advanced algorithms and software for solving problems of computer science, using a variety of techniques; to learn the basics of modern programming languages and programming systems characteristics and skillfully applied in practice to be able to competently prepare the program and debugging, to design programs to know the methods of constructing algorithms oriented data structures
9	Basics of programming	3	5	Algorithms and Data Structures	Object-Oriented Programming	**Aim:** formation of students ' scientific, creative approach to the development of technologies, methods and means of programming. **Content:** Solving programming problems. High-level and low-level programming. High-level programming methods. Standard and typical programming tasks. **Expected result:** the student must acquire the skills of drawing up, debugging and testing programs.
10	Discrete mathematics	3	5	Mathematical analysis, analytic geometry and linear algebra	Numeral Methods	**Aim**: The course of discrete mathematics is part of the foundation of student education, which is of great importance for the successful mastering of general and special disciplines and allows to navigate in the flow of scientific and technical information. **Contents:**The study of discrete mathematics contributes to the development of logical and algorithmic thinking of students, development of research methods and solving mathematically formalized problems, develop the ability to independently analyze applications and to extend, if necessary, their mathematical knowledge. **Expected result:** the study of the main unit of discrete mathematics for the analysis and simulation of real processes in a professional activity; - Training students to apply their knowledge in practice; - Formation of skills and habits of independent study of textbooks in discrete mathematics; - Raising the general level of mathematical culture; - To develop skills of mathematical research applications and the ability to formulate a problem in the specialty in mathematical language.
10	Math statistics	3	5	Mathematical analysis, analytic geometry and linear algebra	Numeral Methods	**Aim**: The purpose of studying the discipline is the formation in future specialists of theoretical knowledge and practical skills in such sections of higher mathematics as, mathematical statistics. Also, the objectives of the study are to illustrate, by examples of mathematical concepts and methods, to students the specificity and role of the course "Mathematical Statistics" in the study of economic processes. It is necessary to develop the ability of students to analyze the results obtained, to instill the skills of independent work and study of literature.

						Contents: Basic concepts: events, their types. Random variables. Definition, types of random variables. Binomial law of probability distribution. Continuous random variables. Statistical estimation of distribution parameters. General and sample totality. Variation series and its characteristics. **Expected result:** Calculate the probabilities of random events; Make up the laws of probability distribution of random variables; To calculate the numerical characteristics of random variables; Conduct estimates of the probabilities of the basic numerical characteristics of random variables; To test hypotheses about the parameters and laws of distribution of random variables; Conduct correlation, regression, and Calculate the probabilities of random events;
11	Programming in VBA	4	6	Computer software	The theoretical basis for the development and implementation of programming languages	**Aim**: The purpose of discipline is to teach students the acquisition of knowledge and skills in the field of application development, technical means of information processing, regular use information technology tools to solve practical engineering problems. **Contents:**Programming languages, their properties Basics of algorithms and programming tasks in high level language. The concept of a file; Static and dynamic data; complex data structures (lists, trees, networks); input and output streams; Main principles and approaches of structured design of algorithms. Methods and tools for object-oriented programming; **Expected result:** Recursion and iteration; sorting and searching. Standards for the development of application software. Documentation, maintenance and operation of the software.
11	Visual programming	4	6	Computer software	The theoretical basis for the development and implementation of programming languages	**Aim**: The aim of the discipline is to acquire students ' knowledge and skills in the field of visual programming, information processing, system application of visual programming in information technology. **Contents:** names, variables, and constants in the Visual C++ programming environment . Operations and expressions. Operators in the Visual C++programming environment. Functions in the Visual C++programming environment. Built-in data types in the Visual C++programming environment. Classes and objects in the Visual C++programming environment. Derived data types in the Visual C++programming environment. Memory allocation in the Visual C++programming environment. Derived classes, inheritance in the Visual C++programming environment. Control access to an object in the Visual C++programming environment. Constructor classes and destructors in the Visual C++programming environment. Additional features of classes in the Visual C++programming environment. The layout of the programs, the preprocessor in the programming environment Visual C++. Error handling in Visual C++programming

						environment. I / o in the Visual C++programming environment **Expected result:** Standards for the development of visual software. Documentation, maintenance and operation of software.
12	Object-oriented programming	4	6	Art programming, Computer software	Methods of teaching Informatics, Database programming	**Aim**: of the given discipline is to study the modern aspects to programming in objects, getting skills in writing programs on object-oriented languages. **Contents:**of studying the discipline, students should know the basic concepts of the theory of algorithms; technology development professional programs (algorithmization); One - two working languages of object-oriented programming; basic software of modern computers for object-oriented programming; method of object-oriented analysis and design. Introduction to OOP. Structural features of object-oriented languages. Inheritance and composition. Basics of object-oriented analysis and design. **Expected result:** Learning outcomes is the acquisition of skills to perform all phases of the application development environments in integral spheres.
12	Programming in Delphi	4	6	Art programming, Computer software	Methods of teaching Informatics, Database programming	**Aim:** The purpose of the study: to give an idea of the concept of the object, events, methods, class, inheritance, polymorphism, encapsulation, familiarity with the Borland Delphi object-oriented programming environment, and study of programming features in the Delphi environment. **Contents:** The program of the course provides for the study of the principles of object-oriented programming based on the study of the system of object-oriented visual programming Delphi. **Expected Result:** Knows the concept of object-oriented programming
13	Information protection	3	5	Information and communication technology	Parallel computing	**Aim**: to give students the necessary knowledge and skills in the field of modern information technologies currently in use, as well as information security. **Contents:**Under the information security refers to security information from accidental or intentional exposure to natural or artificial nature would result in damages to the owners or users of information. The objective of this discipline - to teach students to protect the value of the system, to protect and ensure the accuracy and integrity of information, to minimize the loss, if the information is modified or destroyed **Expected result:** of studying the discipline, students should know the basic concepts, goals and objectives of the IP in the enterprise; the nature and components of IP; principles of organization and stages of IP development system; factors affecting the organization IP
13	Information security	3	5	Information and communication technology	Multiprocessor computer systems and parallel programming	**Aim**: to give students the necessary knowledge, skills and abilities in the field of modern information technologies currently used, as well as information security. **Contents**: the Study of means and methods of

						information security, combating unauthorized access to computer resources both in the local network and on the Internet. **Expected result:** students should know the methodology of the analysis of the effectiveness of the ZI.
14	3D graphics and animation	3	5	Computing modelling	Multimedia technologies	**Aim**: The purpose of the course is to consolidate and expand knowledge in the field of computer graphics with the help of modern graphics packages. Contents: Computer graphics and its capabilities. 3D Studio Max program. Adjust the image quality. Two-dimensional images and their transformations. Three-dimensional geometric transformations. Modern graphics systems. Basics of animation. Types of graphics: raster graphics; vector graphics; 3D-graphics. Principles of raster and vector information, examples. Computer graphic tools: raster editors (Adobe Photoshop), vector editors (Adobe Illustrator, CorelDraw, etc.) 3D-editors, animation, input and output programs of graphic information, electronic media (network and local). Color detection. Color models: RGB, CMY(K), CIE Lab, Hsi etc. Expected result: Mastering the skills of creating professionally-oriented computer geometric models, including architectural and construction drawings, - development of computer-aided design technology.
14	Interactiv graphic system	3	5	Functional programming	Multimedia software	**Aim**: to consolidate and expand knowledge in the field of computer graphics with the help of modern interactive graphics systems and graphics packages. Contents: Introduction. Two-dimensional images and their transformations. Three-dimensional geometric transformations. Decomposition into a raster of the simplest curves. Models of illumination. Lambert's Law. Methods of painting. Smoothing algorithm. Interpolation and approximation of curves and surfaces. Modern graphics systems. Introduction to engineering graphics. Basics of animation. Expected result: Mastering the skills of creating professionally-oriented computer geometric models, including architectural and construction drawings, the development of computer-aided design technology.
15	Numeral Methods	2	3	Discrete mathematics	Preparation of the graduation work	**Aim**: is to teach the techniques of construction, theoretical basis, the use of numerical algorithms for solving various classes of mathematical problems. **Contents:**Numerical methods of algebra. Approximation of functions. Numerical integration. Methods for the numerical solution of ordinary differential equations. **Expected result:** To be able to approximate numerically solve the fundamental problem of algebra, geometry, calculus, differential equations, etc.

15	Methods of optimization and reseatch operations	2	3	Discrete mathematics	Preparation of the graduation work	**Aim**: to learn the theoretical and practical material presented in the course of optimization methods and operation research **Contents:** Linear programming. Solving linear programming problems. Dual linear programming problem. Transport problem. Integer programming. Multicriteria optimization problems. Function optimization methods. Methods search for extrema of functions of one variable. Search for extremums of the function of several variables (unconditional optimization). Nonlinear programming. Methods of fines. Quadratic programming. Dynamic programming models. **Expected result:** learn optimization techniques to perform a number of tasks
16	Methods of teaching Informatics	3	5	Information and communication technology	Preparation of the graduation work	**Aim**: of discipline is to study the issues of teaching methods of computer science, computer education, methods of teaching the basics of programming and programming languages. **Contents:**General methods of teaching science. Modern computer technology. Operating systems and software. Methods of teaching software engineering. Means of communication with a personal computer. **Expected result:** The student should be able to use modern software application, the skills of programming languages
16	Means for processing of graphic information	3	5	Information and communication technology	Preparation of the graduation work	**Aim**: of teaching is: to teach the knowledge and skills of using modern software. **Contents:**Computer graphics System. Computer graphics. Vector, raster graphics. Integrated software tools. Application software user. Own development environment. Workstation. Graphics packages. **Expected result:** of the development of the discipline the student must: Know the classification system and application software; theoretical foundations of computer software; purpose and capabilities of the basic and applied computer software.
MAIN DISCIPLINES						
Elective courses (EC)						
1	Informational management	3	5	Information and communication technology	Informational systems	**Aim**: of discipline is to develop in students the system, strong knowledge in the field of information management, the acquisition of practical skills of students to perform basic management functions in the field of information systems and information technology, training of competitive specialists of high and medium level, provides organizations the use of modern information resources. **Contents:**The main objective of the study is to acquire discipline students with a solid knowledge and practical skills in the area defined by the main purpose of the course. The concept of information management. Information management tasks. Development of information system and ensure its maintenance. Systematic analysis

						of information and computer systems and technologies. Planning information system environment. Basics of strategic information systems planning. Information systems they use to support decision-making. The information system of the organization. Criteria for evaluation of the IT and IP. Personnel management in the field of information. Comprehensive protection of information resources. **Expected result:** of the development of the discipline the student should know: managerial role IT manager at various stages of the life cycle of information products; strategic planning of IT and IS in the facility management, assessment of the advantages and disadvantages of procurement of finished or developing new IT and IS, the evaluation criteria of the IT and IP; principles of personnel management information sphere; monitor the implementation and operation of IT and IP, evaluation and analysis of their quality.
1	Fundamentals of Entrepreneur ship in Management	3	5	Information and communication technology	Informational systems	**Aim:** The goal is to familiarize students with methods and algorithms for finding optimal solutions for various kinds of tasks **Contents**: The main sections and areas of discipline. Mathematical models and methods. Unconstrained and constrained optimization. Mathematical programming. Models of linear programmirovaniya. **Expected result:** know methods for solving extreme problems for functionals and funktsiy.Umeniya: able to make mathematical models of extreme practical tasks and to use known methods of solution and draw conclusions
2	Informational systems	3	5	Informational management	Database programming	**Aim**: of this course is to develop in students a holistic view of the processes of transformation of the information, the system of information exchange, tasks and functions of information systems, the principles underlying the classification, data models, data representation in computer memory, the basics of the design, creation, maintenance and modernization information systems and the prospects for the development of information processes and systems. **Contents:**Information systems Classification of information systems. Th life cycle of information systems. The mai phases of designing an information systen life cycle structure of the informatio system. The life cycle model of informatio system. Methodology and technology development of information systems Relational databases. Relational databas management. Manage database objects. **Expected result:** the basic concepts of economic information system and its

						components; foundations of information exchange; the tasks and functions of information systems; composition and structure of information systems
2	The theory of information systems	3	5	Informational management	Database programming	**Aim:** The purpose of the discipline is to form specialized in the construction of models and methods of information systems of various classes and purposes. **Contents:** The main tasks of systems theory. Brief History. The terminology of systems theory. System analysis. Kachestennye kolichetvennye and methods for describing IP. Cybernetic podhod. **Expected result:** Imet idea of the structure of the information process; own methods formalized description of information processes and facilities;
3	Programming in Internet	3	5	World information resources	Multimedia technologies	**Aim**: of the course is the development of practical methods of Web-design and Web-based programming. **Contents:**Introduction to the Web-design. Global computer networks: basic concepts, principles of operation. Directories. Bots. Hypertext Markup Language page HTML: general structure of the document, paragraphs, colors, links. Hypertext Markup Language page HTML: lists, graphics (graphic formats, graphical object as a reference). Hypertext Markup Language page HTML: table. Frames. Common approaches to site design. Development of a page layout. Hypertext Markup Language page HTML: forms. Using styles with the design of the site. Specifications CSS1, CSS2. Hosting. Free hosting. FTP. Placing an Internet resource on the server provider. Register online resource directories and search engines. **Expected result:** of studying the discipline a student must:To know the basic definitions and concepts of Web-design and Web-based programming, basic techniques of creation and promotion of sites; be able to develop and promote problem-oriented Web-resources;To master the techniques of design, development and marketing of problem-oriented Web-resources.

3	Programming technology	3	5	Operating systems,speheres and covers	Multimedia software	**Aim**: of discipline is to develop the students' scientific and creative approach to the development of technologies, methods and tools for software production. **Contents:**The course focuses on the study of high-level programming techniques. Considered routine tasks and typical examples of the practice of programming. Solving computational problems and programming tasks. **Expected result:** of studying the discipline a student must acquire skills compiling, debugging and testing programs as well as the development and use of interface objects.
4	The theoretical basis for the development and implementation of programming languages	3	5	Theory of languages and automata, Programming in VBA	Theory of language programming and translation methods	**Aim**: To develop the competence of students in the application of theoretical computer science unit at the decision of professional information problems. **Contents:**The concept of information. Information processes. Continuous and discrete forms of information. Quantity and unit of measurement information. Computer processing means as a universal information. The concept of the algorithm and its basic properties. Artist algorithms. Ways of representing algorithms. Recursion and iteration. The notion of complexity of the algorithm. The asymptotic complexity of the algorithm. Realizable algorithms. Polynomial algorithms. That the classes of polynomial algorithms and realistic. The main methods for developing efficient algorithms (balancing method, dynamic programming, a change of data). Exhaustive search. The complexity of the problem. Upper and lower bounds. The concept of a difficult task. Modeling as the main method of scientific knowledge. Different types of models. The discrete nature of the computer. Optimization algorithms on networks and graphs. **Expected result:** of studying the discipline, students should know: current status and trends in the development level of hardware and software, computer equipment; the basics of working in local and global computer networks; foundations of modern technologies for processing and analyzing information and their impact on the success in professional activities.
4	SQL language	3	5	Theory of languages and automata,	High-level programming languages	**Aim**: To acquaint with information technology, database administration and acquisition techniques optimize

				Programming in VBA		performance SQL-server. **Contents:**Transact-SQL (T-SQL) - a procedural extension of SQL. SQL has been extended by additional features such as: control operators, local and global variables, various additional functions for processing strings, dates, mathematically, etc., authentication support Microsoft Windows. The Transact-SQL is the key to using SQL Server. All applications that interact with an instance of SQL Server, regardless of their implementation and the user interface, the server sends instructions Transact-SQL. **Expected result:** to know the basic structure of algorithmic programming language to develop the program; to be able to correctly formulate the problem statement implemented; have practical skills in preparation of algorithms for solving problems and its implementation; able to competently analyze the solutions obtained.
5	The theory of programming languages and translation methods	3	5	Theory of languages and automata, The theoretical basis for the development and implementation of programming languages, System programming	Preparation of the graduation work	**Aim**: Preparation of competitive specialists of higher and secondary level provides organizations the use of modern information resources. The main objective of the study is to acquire discipline students with a solid knowledge and practical skills in the area defined by the main purpose of the course. **Contents:**Translators. Purpose classification. Main components of the broadcast. Some aspects of the compilation process. Design Compiler. Grammar and language. Two strategies indiscriminately. Scanner. Regular expressions and finite automata. Deterministic finite automaton. Representation in the computer. Non-deterministic finite automaton. Construction of the spacecraft from the NCA. Programming the scanner. The state diagram. Parsing techniques. Parsing the top down. LL (1) parsing -method. LL (1) parsing -Table. Ascending parsing. Methods based on precedence. Precedence relationships. Simple precedence grammar **Expected result:** of studying the discipline a student must acquire skills compiling, debugging, and testing programs, as well as the development and use of interface objects.
5	High-level programming language	3	5	System programming Theory of languages and automata, SQL language	Preparation of the graduation work	**Aim**:the expansion of professional horizons of students acquainted with the technology of modular programming, the development process of software development using modern methods and technologies. **Contents:**General principles of software development. Features of object-oriented programming in Delphi. Programming in Delphi. Distributed programming technologies (COM, CORBA). Network programming. Working with remote objects. Servlets. Servlets and ambiguity.

						Processing sessions. Embedded objects. Remote Method Invocation (Remote Method Invocation - RMI). Modern development environments of object-oriented programming (Visual Studio NET, C #) **Expected result:** After studying the discipline, students should be able to: - Make a choice of low-level and high-level programming, depending on the task; - Practical use of procedural, functional, modular programming; - Practically use the methodology of object-oriented, visual, event-driven programming.
6	Parallel Computing	3	5	Object-oriented programming, Information protection	Preparation of the graduation work	**Aim**: of this course is to acquire knowledge and skills in the basics of parallel programming and parallel data processing using computers. **Contents:**Demand for parallel computers. Parallelism. Evaluating the effectiveness of parallel programming. Processes and synchronization. Parallel algorithms. Parallel programming. **Expected result:** of studying this discipline, students should be able to develop an effective algorithm for parallel computation for applications
6	Multiprocessor computer systems and parallel programming	3	5	Object-oriented programming, Information protection	Preparation of the graduation work	**Aim**: of the discipline - the study of characteristics of the organization of computers, systems and computer networks, principles of construction of individual devices and their interaction in the process of input, processing and output. Problems of the discipline - the study of the principles of functional and structural organization of computers, systems, complexes and computer networks, arithmetic, logic and the foundations of computer schematic. **Contents:**Introduction to multiprocessor computer systems. Architecture multiprocessor computer systems. Methods and algorithms for programming parallel computing. Parallel programming using PVM. Parallel programming using MPI. **Expected result:** of studying this discipline, students should be able to justify use of computer technology in automation systems; - Select the optimal network technology for providing information for management systems
7	Systems of artificial intellect	3	5	Information and communication technology, Theory of languages and automata	Preparation of the graduation work	**Aim**: This discipline aims introduction to the problems and methods of solving the problems of development of artificial intelligence. **Contents:**Introduction. Conceptual Foundations of Artificial Intelligence. Basic concepts of AI. Objectives and methods of AI. Pattern recognition. Methods of knowledge representation. First-order predicate logic. Semantic

						networks and frames. **Expected result: a**Have an understanding of the different types of intelligent systems
7	The theory of artificial intellect	3	5	Information and communication technology, Theory of languages and automata	Preparation of the graduation work	**Aim**: the study of general concepts and terminology of artificial intelligence (AI) as an applied science, architecture AI systems in modern production, tools, implementation of the principles of AI in mechatronic and robotic systems, as well as the acquisition of basic skills in the field of automation solutions of difficult tasks that still long considered the prerogative of man, including the design of intelligent systems (IS) for production purposes. **Contents:**General information. AI problems in robotics and mechatronics. Basic definitions. AI problems in robotics and mechatronics. Structure and function of intelligent control system. Scientific schools in the field of AI. The history of the development of AI systems. **Expected result:** After completing the course, students should be able to: build a structure of AI systems to solve a technical problem; create a knowledge base on the basis of different types of knowledge representation.
8	Multimedia technologies	3	5	Programming in Internet, 3D graphics and animation, World information resources	Preparation of the graduation work	**Aim**: the study of multimedia technologies. **Contents:**Basic concepts of multimedia technologies. Hardware and software technology and multimedia production. Overview of hardware multimedia. The main components of multimedia applications and software for their creation and processing. Technology of production of multimedia applications. By Author multimedia. **Expected result:** Knowledge of PC configuration for multimedia. Knowledge components for multimedia applications. Software for the development of multimedia applications.
8	Multimedia software	3	5	Programming in Internet, 3D graphics and animation, World information resources	Preparation of the graduation work	**Aim**: the study of multimedia technologies. Basic concepts of multimedia technologies. **Contents:**Hardware and software technology and multimedia production. Overview of hardware multimedia. The main components of multimedia applications and software for their creation and processing. Technology of production of multimedia applications. By Author multimedia. **Expected result:** Knowledge of PC configuration for multimedia. Knowledge components for multimedia applications. Software for the development of multimedia applications.
9	Database programming	3	5	Informational systems	Preparation of the graduation work	**Aim**: The study of database design techniques used in the development of information systems used in - various spheres of economic activity; **Contents:**- Mastery of the theoretical

						foundations of databases.Basic concepts of database theory. Data Bank, as an information system. Typology of databases. Transaction processing systems. Data integrity and security. Information storage. Object-oriented databases. Distributed database systems and client-server. Promising model databases. The publication of databases on the Internet. Modern database management systems and their application. Organization of data warehouses. **Expected result:** Upon completing the course is the study of methods of development of relativistic databases, as well as the objects and methods of object-oriented development environment Delphi software applications designed to work with databases and the acquisition of solid skills in Delphi with database programming, the study of the organization and work local area networks with databases
9	Programming in PHP	3	5	Informational systems	Preparation of the graduation work	**Aim**: currently, - one of the most popular languages to implement the web application. This course focuses on the study of its foundations. The emphasis is on the practical application of skills. PHP language was created to solve specific practical problems in the Internet environment. Familiarity with the language PHP, skills development design and programming web applications. **Contents:**The methods of separation of instructions, create comments, variables, constants and data types, operators. Conditional statements (if, switch), work with loops (while, for, foreach) and use functions include, require. **Expected result:** To have an understanding of programming languages and client-server technology. know the principles of the Internet - Services; To be able to create static and dynamic Web - page.

LIST
elective courses for the educational program
in the specialty 5B060200 "Informatics"

Form of study: full-time
Educational period: 4 years

Name of Discipline	Discipline Code	Credits		Semester
		RK	ECTS	
General educational disciplines				
Component on a choice 1				
Ecology with the basics of life safety	EWBS 1106	2	3	1
Psychology	Psy 1106	2	3	
Component on a choice 2				
Political Science	PS 2107	2	3	
Sociology	Soc 2107	2	3	
Culturology	Cul 2107	2	3	
Bases of anti-corruption culture	BAC 2107	2	3	3
Component on a choice 3 (Established HEI)				
Religious	Rel 3108	3	5	5
Basic disciplines				
Component on a choice 1				
Computer architecture	CA 1209	2	3	1
Techics of computer and communication systems	TCCS 1209	2	3	
Component on a choice 2				
Analytic geometry and linear algebra	AGLA 1210	3	5	1
Calculation methods and computational practice	CMCP 1210	3	5	
Component on a choice 3				
Application packages program	APP 1211	3	5	2
Applied software	AS 1211	3	5	
Component on a choice 4				
System programming	SP 2212	4	6	3
System software	SS 2212	4	6	
Component on a choice 5				
World informational resources	WIR 2213	3	5	3
World informational systems	WIS 2213	3	5	
Component on a choice 6				
Computing modelling	CM 2214	3	5	3
Mathematical and computer modeling	MCM 2214	3	5	
Component on a choice 7				
Theory of languages and automata	TLA 2215	3	5	4
Algorithmic languages and programming	ALP 2215	3	5	
Component on a choice 8				
Computer Software	CS 2216	3	5	4
Practices on the electronic computer	PEC 2216	3	5	
Component on a choice 9				
Art Programming	AP 2217	3	5	4
Basics of programming	BP 2217	3	5	
Component on a choice 10				
Discrete mathematics	DM 2218	3	5	4
Math statistics	MS 2218	3	5	
Component on a choice 11				
Programming in VBA	PVBA 3219	4	6	5
Visual programming	VP 3219	4	6	
Component on a choice 12				
Object-oriented programming	OOP 3220	4	6	5
Programming in Delphi	PD 3220	4	6	
Component on a choice 13				
Information protection	IP 3221	3	5	5
Information security	IS 3221	3	5	

Component on a choice 14				
3D graphics and animation	3DGA 3222	3	5	6
Interactive graphic system	IGS 3222	3	5	
Component on a choice 15				
Numeral Methods	NM 3223	2	3	6
Methods of optimization and research operations	MORO 3223	2	3	
Component on a choice 16				
Methods of teaching Informatics	MTI 4224	3	5	7
Means for processing of graphic information	MPGI 4224	3	5	
Component on a choice 1				
Main disciplines				
Component on a choice 1				
Informational management	IM 2303	3	5	4
Fundamentals of Entrepreneurship in Management	FEM 2303	3	5	
Component on a choice 2				
Informational systems	IS 3304	3	5	5
The theory of information systems	TIS 3304	3	5	
Component on a choice 3				
Programming in Internet	PI 3305	3	5	6
Programming technology	PT 3305	3	5	
Component on a choice 4				
The theoretical basis for the development and implementation of programming languages	TBDIPL 3306	3	5	6
SQL language	SQLL 3306	3	5	
Component on a choice 5				
The theory of programming languages and translation methods	TPLTM 4307	3	5	7
High-level programming language	HLPL 4307	3	5	
Component on a choice 6				
Parallel Computing	PC 4308	3	5	7
Multiprocessor computer systems and parallel programming	MCSPP 4308	3	5	
Component on a choice 7				
Systems of artificial intellect	SAI 4309	3	5	7
Theory of artificial intellect	TAI 4309	3	5	
Component on a choice 8				
Multimedia technologies	MT 4310	3	5	7
Multimedia software	MS 4310	3	5	
Component on a choice 9				
Database programming	DP 4311	3	5	7
Programming in PHP	PPHP 4311	3	5	