Kazakh Humanitarian Juridical Innovative University
Faculty of Information Technology and Economics
Department of "Information and technical Sciences»

6B06123 IT IN HEALTHCARE
CATALOGUE OF ELECTIVE COURSES

Year of admission – 2021

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Created by department of Information and technical Sciences
Developed by the Department of Information and technical Sciences
Minutes № _____ from «__» _____ 20___ y.
The head of Department of Information and technical Sciences _____ Aukenov B.M.

Considered and approved at the meeting of educational-methodic Council of the faculty
Minutes № _____ from «__» _____ 20___ y.
The head of EMC of the faculty _____ Shoibakova E.O.

Approved at the meeting of EMC of the University
Minutes № _____ from «__» _____ 20___ y.
The chairman of EMC of the University _____ Zharykbasova K.S.

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Awarded degree: bachelor in the field of information and communication technologies in the educational program 6B06123 "IT IN HEALTHCARE"

Group educational programs: 5B057-Information technology

Elective course №	The name of subject		Prerequisites	Postrequisites	Short description of the content, the aims of education, expected results
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	-	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	-	**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	-	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	-	**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	Databases in IP	5	School course of informatics	Database administration on the MS SQL Server platform,	**Цель дисциплины: научить составлять псевдонимы и таблицы баз данных. Ознакомив с компонентами TTable, TDatasource, TDBGrid, TDBEdit, TDBNavigator, показать особенности их**

				information systems administration	**применения в программировании. Цель : владение навыками работы с современными реляционными системами управление базами данных; применение знаний в дальнейшей профессиональной деятельности; деятельности. Задачи: систематическое введение в идеи и методы, используемые в настоящее время реляционные системы управления базами данных; формирование алгоритмического мышления студентов для освоения основные навыки проектирования и реализации баз данных Уметь:: базовыми функциями и типовой организацией систем управления; данные (СУБД); Основные понятия реляционной модели данных; внутренняя организация современной многопользовательской СУБД; Основы языка реляционных баз данных SQL. На построение логической и физической модели проектируемой базы данных Проектирование баз данных и программирование работы в различных СУБД с ними; Составление отчетов, форм, запросов;; Проведение многомерного анализа данных.**
1	Database concept	5	School course of informatics	Information security and Information Protection, database administration on the MS SQL Server Platform, Information System Administration	**The purpose of the discipline: the organization of database management systems and database management systems, the principles of construction, operation and evaluation of the characteristics of databases and their management systems, the acquisition of knowledge and skills by students in the field of database design and use. Contents: Basic concepts of database theory. A data bank as an information system. Database typology. Transaction processing systems. Data integrity and security. Information repositories. Object-oriented database. Distributed database and client-server system. Expected result: Must know: - the purpose of the discipline and the main components of the database system, the levels of data representation, the main data models used in industrial DBMS; - Modern methods of database design; - modern database management systems of software products necessary for creating databases of complex organizational systems - theoretical foundations and basic principles of building databases of information systems. Be able to perform: - development of relational database structure, creation of user applications with interactive DBMS tools; - creation of complex queries and programs (scripts) for the implementation of multi-user queries and relational database processing; Be able to: - methodology and methodology of research of the enterprise information model; modern methods of database creation; creation and administration of decentralized databases with Access 2010, MS SQL Server DBMS utilities.**
2	Operation systems	5	World information	Information Systems	**Objective:** to teach the knowledge and skills of using modern software, to gain knowledge of modern operating

			systems	Software Programming Technologies	systems, their functional architecture, the resources and methods they implement, and the management of computer complex resources. To teach knowledge and skills in the use of modern software, to acquaint with effective algorithms for solving various scientific and technical problems. **Contents:** General information about operating systems. History of operating systems. The architecture of the operating system. The main functions of the OS. Processes and threads. Memory management File systems Control input, output. Architectural features of the microprocessor model. Real memory management. Configure network settings and share resources in local area networks. Programming with system calls in the Windows operating system, in the Linux System shell **Expected Result:** **Know:** - mainframe operating systems; - server operating systems; - operating systems for personal computers; - real-time operating systems. **Able to:** - to make a review of the computer software; - provide service for operating systems; - create system calls, system programs; - work with different operating systems; - use the interpreter or command shell, the structure of operating systems. **Possess skills**: -skills for solving typical problems of system programming of modern operating systems; -skills of work with various operating systems and their administration
2	Operating systems and PC software	5	World information systems	Information Systems Software Programming Technologies	**Objective**: to teach the knowledge and skills of using modern software, to acquaint with effective algorithms for solving various scientific and technical problems. **Content:** Introduction. Disks and file systems. Configuring and configuring operating systems. Work with the network. Environments and shells. Organization of work in a team and support tools; automation of software design; principles of construction, structure and technology of using CAD software. **Expected Result:** **Know:** - The basic architectural concepts of building and distribution of operating systems; - the main components of operating systems, their purpose and interconnection; A**ble to:** - make a choice of the operating system according to its purpose and characteristics; - to choose the distribution of the operating system and install it on a personal computer; - provide basic configuration of the operating system in the environment of its operation. **Possess skills:** - computer skills to manage information; - - knowledge and skills to solve practical problems of supporting the OS.
3	Fundamentals of robotics and artificial intelligence	6	Information and communication technologies (in English)	Audit of information security	**Purpose:** familiarizing students with the basics of robotics, training programs for mobile robots **Contents:** Fundamentals of robotics. Physical fundamentals of robotics.Information in modulating, information processes.Design basics.Mobile work. From simple to complex.Algorithmization. Programming mobile robots.The decision of applied problems. Education robotics. **Expected Result:** **Know:** methods of comparative analysis and evaluation of

					mathematical models of automation and robotization systems of production processes using modern data software products; methods of constructing algorithms aimed at the structure of the **Able to:** - design of automation and robotization systems; comparative analysis with the use of modern software products for robotization of technological complexes and production process automation systems in various industries,as well as artificial intelligence methods; **Possess skills:** formation of modern trends in the development of robotic systems and automation of production processes
3	Robotic systems and complexes	6	Information and communication technologies (in English)	Audit of information security	**Objective** development of abilities for creative self-realization through the development of design skills in the process of creating robotic systems. **Contents:** Robot actuators.Computing devices in the control system for robots and flexible production modules. Software control systems for industrial robots. Adaptive robot control systems. Robot sensitivity systems.Remote-controlled robots and manipulators. Solving software problems of applying robotic systems. **Expected Result:** **Know:** industrial robot control systems; about remotely controlled robots; **Able to:** using robotic systems learning to solve programming problems **Possess skills:** information processing; organization of work on the collection, storage and processing of information used in the field of professional activity
4	Public health and health	6	Sociologists,Psychologists fundamentals of economic theory, fundamentals of law	Informatization of healthcare	Purpose: unified national health information system of Kazakhstan. E-health development concept of the Republic of Kazakhstan Objects and subjects of Informatization in the field of health care. Principles of Informatization in the field of health care. Protection of personal data of individuals (patients). Content: unified national health information system of Kazakhstan. E-health development concept of the Republic of Kazakhstan Objects and subjects of Informatization in the field of health care. Principles of Informatization in the field of health care. Protection of personal data of individuals (patients). Expected result: At the end of the course, students are formed. Know: - on basic terms and concepts; - on the theoretical basis of the social health and healthcare as a scientific subjects and subjects taught (tasks, subjects, methods, principles); - on the history of formation and development disciplines; - the role and place of social and biological factors in the formation of health (public, group, family, - individual) and organizations - healths; - medical aspects of ethics and - deontology in the work of a doctor: Skills. - to register the data of patients who applied for medical help in the organization of primary health care; - to arrange the medical documentation of patients, obtained medical assistance in the organization of primary health care; - implementation of pre-appointment of patients to see doctors and registration of calls to doctors at home.

					- to receive from the ambulance service unreasonable calls during business hours Primary health care and to carry out the transfer of unjustified calls to emergency medical care at stations. - to inform the population about the order the work of the clinic, the time and place reception of the population by the chief physician, his deputies, doctors and all specialties, the volume of diagnostic research in the clinic. Proficiency: - forming register of attached - population, including in electronic - format; - carrying out the selection and delivery of medical documentation to doctors ' offices; - proper maintenance and storage - card index - to regulate the intensity of the population flow in order to create a uniform loads of doctors.
4	Social Medicine	6	Sociologists,Psychologists fundamentals of economic theory, fundamentals of law	Informatization of healthcare	Purpose: unified national health information system of Kazakhstan Content: Concept of development of e-health of the Republic of Kazakhstan Objects and subjects of Informatization in the field of health care. Principles of Informatization in the field of health care. Protection of personal data of individuals (patients). Expected result: At the end of the course, students are formed. Know: - on basic terms and concepts; - on the theoretical basis of the social health and healthcare as a scientific subjects and subjects taught (tasks, subjects, methods, principles); - on the history of formation and development disciplines; - the role and place of social and biological factors in the formation of health (public, group, family, - individual) and organizations - healths; - medical aspects of ethics and - deontology in the work of a doctor: Able to: - to register the data of patients who applied for medical help in the organization of primary health care; - to arrange the medical documentation of patients, obtained medical assistance in the organization of primary health care; - implementation of pre-appointment of patients to see doctors and registration of calls to doctors at home. - to receive from the ambulance service unreasonable calls during business hours Primary health care and to carry out the transfer of unjustified calls to emergency medical care at stations. - to inform the population about the order the work of the clinic, the time and place reception of the population by the chief physician, his deputies, doctors and all specialties, the volume of diagnostic research in the clinic. Possess skills: - forming register of attached - population, including in electronic format; - carrying out the selection and delivery of medical documentation to doctors ' offices; - proper maintenance and storage card index - basicity regulation of the flow of the population with the aim of creating a uniform loads of doctors.
5	Information and communication technologies in medicine	6	World information systems Medbiophysics	Informatization of healthcare, Administration of information systems	**Purpose:** the Use of information and communication technologies to address a number of issues in medicine: 1. Creation of information resources in the medical industry. Status and tasks of information systems at various levels 2. Direction of formation of it in the

					medical field. Progressive domestic and foreign theories and practices 3. Legal and technological assistance of information exchange in medicine. 4. The use of telecommunications and the Internet to provide medical services 5. Reference tools and services to help solve health issues, training projects and research. The use of artificial intelligence 6. The use of automated Analytics in administrative matters 7. Information technologies in the system of continuous training of employees of medical organizations. **Contents:** Medical Informatics. Classification of medical information systems. Medical instrumentation and computer systems. Medical diagnostics. Systems for monitoring. Medical process control systems. Ways of development of medical it. Telemedicine. **Expected result:** **Know:** - medical and clinical information technologies introduced in Kazakhstan; - the main problems of automation of health care in Kazakhstan. - the role of new technologies in medicine. **Able to:** - apply information technologies in medicine; - establish an accurate diagnosis using medical devices and completely cure the patient. **Possess skills:** - about the latest research, development and technology in medicine.
5	Medical informatics	6	World information systems Medbiophysics	Informatization of healthcare, Administration of information systems	**Objective:** Optimization of information processes in medicine through the use of computer technology, which improves the quality of public health. **Contents:** Introduction to medical Informatics. Modeling in biology and medicine. Statistical analysis of biomedical data. Medical information systems in the diagnostic and treatment process. **Expected result:** **Know:** - theoretical bases of medical Informatics; - computer applications for solving medical and health problems. **Able to:** - use modern software to solve the problems of evidence-based medicine, clinical research automation, management Informatization in the health care system; - use the medical information system for diagnosis, prevention, treatment and rehabilitation in the clinic of internal diseases. **Possess skills:** - the theory of medical Informatics, as well as the practice of applying modern information technologies in the application to medicine and health care.
6	Computer-aided design systems in medicine	5	World information systems, Information and communication technologies in medicine	Biostatistics Information Systems Software	**Purpose:** to Instill in students the skills of design, calculation, construction of medical equipment in graphic editors of computers; to instill in students the skills of maintenance and repair of devices using computers. **Contents:** Section 1.Computer technology research.The role of hardware and computer technology in medical and biological research. Information-structural models of biomedical research.Basic operations for the preparation and research of the biological object. Development of a model of physiological research. Section 2. Automated research systems. Criteria of optimization of technology of performance of medical experiment. Algorithmic and software for biomedical research. Automated systems of registry, medical records, control of medical equipment and consumables. Application software for automated diagnostic, therapeutic and laboratory systems and complexes. Examples of practical implementation of computer technologies in biomedical research.

					Expected result: **Know:** -the idea of graphical programming, the means of creating the drawing in the graphic editors, methods of building drawing; -General understanding of the types of automated systems for research; determine the place of application of medical equipment; describe the stages of development of biomedical technology; **Able to:** - organize the process of building and editing drawings of medical equipment; - to form skills of working with AutoCad program; - to apply in practice graphic editors in professional activity; - use catalogs of drawings and Internet resources to find the necessary literature and materials. **Possess skills:** -the theory of medical Informatics, as well as the practice of applying modern information technologies in the application to medicine and health care.
6	Automation of production	5	World information systems, Information and communication technologies in medicine	Biostatistics Information Systems Software	**Purpose:** to Form basic knowledge and skills in automation, understanding of modern automated production; formation of students ' knowledge and skills necessary for the future bachelor of technological education. **Contents:** General concepts of automation. Production and technological processes in mechanical engineering. Production automation. Automation of control and control in the production of machines. Automatic control system. **Expected result:** **Know:** - appointment, classification, device and principle of operation of automation in production; - General structure and structure of the computer, technical and software means of implementation of information processes, technology of automated information processing, local and global networks. **Able to:** - analyze the readings of control and measuring devices; - make an informed choice of equipment, mechanization and automation in professional activities. **Possess skills:** - skills of solving problems of automation, a choice of methods and automation; - software for development of automated technological processes.
7	Programming Technologies	5	Operation systems	Database systems, Information security and information security, Administering databases in the MS SQL Server platform, Administration of information systems	**Purpose:"**programming Technology " is to teach students a systematic understanding of the principles of construction and design of software systems. **Contents:** Basics of programming in the C+environment. Basic concepts and approaches. Techniques to ensure the manufacturability of software products. Technical development tasks. Software design with a structural approach to programming. Testing and debugging of software products at structural approach. Software design with an object-oriented approach to programming. Development of user interfaces. Software quality assessment provisions. **Expected result:** **Know:** - principles design of software systems; - organization of the software design process; - methodology of structural design of SOFTWARE; - object methodology- oriented SOFTWARE design;

					- technological means of software development; - methods of decomposition and abstraction in SOFTWARE design; - methods of debugging and testing programs; - methods of protection of programs and data ; **Able to:** - to use the methods of decomposition and abstraction in the design FOR; - apply software development tools: development tool environments, project support tools, debuggers; - document and evaluate the quality of software products; - design user interfaces. **Possess skills:** - methods and means of development and registration of technical documentation; - methods of software design with structural and object-oriented approach ; - methods of structural and functional testing; - methods of joint development applications'.
7	Programming of databases	5	Operation systems	Database systems, Information security and information security, Administering databases in the MS SQL Server platform, Administration of information systems	**Purpose:** the Study of database design techniques used in the development of information systems used in various fields of economic activity; mastering the theoretical foundations of database construction. **Contents:** basic concepts of database theory. Data Bank as an information system. Database typology. Transaction processing systems. Data integrity and security. Data warehouse. Object-oriented databases. Distributed databases and client-server systems. Promising models of databases. Publication of databases on the Internet. Modern DBMS and their application. Organization of data warehouses. **Expected result:** **Know:** - the concept of information, data, data types, data models; - the concept of databases, database requirements; - levels of data presentation in the database; - language means of data processing in modern DBMS. **Able to:** - distinguish data from information; - describe the structure of relational database tables; - maintain the reliability and safety of data in a relational database; - use SQL to create, modify, and manage data in relational databases; - to search, collect, process, analyze and systematize information in the economy, management and ICT. **Possess skills:** - practical skills of presenting information in modern DBMS.
8	Medical electronics	5	Information and communication technologies in medicine	Biostatistics,Modeling of information	**Objective**: The goal is to prepare students in solving typical problems of optimal planning and management. In the process of studying the discipline, deterministic methods and models for substantiating decisions are considered. **Content:** The main sections and directions of discipline. Mathematical models and methods. Tasks unconditional and conditional optimization. Mathematical programming. Linear programming models. Know: knows methods of solving extremal problems for functionals and functions. **Expected result:** **know:** - scientific and applied aspects of the study of patterns inherent in the systems; - general methods of operations research and their classification; the structure of a mathematical model of optimization problems (linear, nonlinear, dynamic programming);

					- research methods and design principles of deterministic models of operations: **Able to:** - based on the initial data of the real problem, make up a mathematical model, determine the type of the task and choose the best solution from this point of view; - solve a linear programming problem by a graphical method in the case of two variables; **Possess skills:** - basic concepts of operations research (model, optimality criterion, objective function, system of constraints, reference plan, optimal plan, extremum); - methods for optimizing linear, nonlinear, dynamic programming problems
8	Basics of designing medical devices and systems	5	Information and communication technologies in medicine	Biostatistics,Modeling of information	**Purpose:** Is to teach students how to master the technology of designing and maintaining information systems for managing an enterprise. **Contents:** Basic concepts: management, process control, control system. Classification of control systems. Resource management manufacturing enterprise. Resource management holding. Customer relationship management and alignment of production plans with customer needs. Supply chain management. Process-oriented management. The evolution of management information systems. Modeling information management systems. Modeling metaclasses. Modeling entity classes Workflow modeling. **Expected Result:** **Know:** - classification, architecture, approaches to the development of enterprise management information systems; **Able to:** - to formulate, document and solve the problem of information support for enterprise management processes; **Possess skills:** - methods of designing information management systems; - skills of working with instrumental tools for designing information management systems.
9	Medical Statistics	5	Public health and health	Biostatistics	Objective: basic health statistics. Statistics on the health of the population and the natural movement of the population. Indicators of the health of the population . Performance indicators of the doctor and medical organization. Contents: Fundamentals of health statistics. Statistics on the health of the population and the natural movement of the population. Indicators of the health of the population . Performance indicators of the doctor and medical organization. Expected result:: At the end of the course, students are formed: Know: - on the essence, basic concepts, principles and methods of medical statistics, in the field of application of statistics in solving problems of public health and health; - methodology, planning and organization of statistical observation (forms, types, methods and stages of statistical observation) - on the nature, application, methods of calculation and basis of analysis of descriptive statistics -about rules of registration and representation of results of statistical supervision; -on the main methods of calculation of indicators of public health (basic demographic indicators and morbidity); -about the main methods of calculation of indicators of

					activity of out-patient and polyclinic institutions and hospital; Able to: - formulate goals and objectives of the study; - to plan, organize and carry out statistical observation in accordance with the objectives. - use tabular and graphical methods of presentation of statistical observation materials; - to formulate conclusions arising from the results of statistical observation, and to give a General conclusion on them ; Possess skills: - public speech, argumentation, discussion and debate; - ability to expand and deepen the scientific worldview; - ability to independently acquire and use new knowledge;
9	Statistics of healthcare system	5	Public health and health	Biostatistics	Objective: basic health statistics. Statistics on the health of the population and the natural movement of the population. Indicators of the health of the population . Performance indicators of the doctor and medical organization. Contents: Fundamentals of health statistics. Statistics on the health of the population and the natural movement of the population. Indicators of the health of the population . Performance indicators of the doctor and medical organization. Expected result: at the end of the course, students are formed: Know: - on the essence, basic concepts, principles and methods of medical statistics, in the field of application of statistics in solving problems of public health and health; - methodology, planning and organization of statistical observation (forms, types, methods and stages of statistical observation) - on the nature, application, methods of calculation and basis of analysis of descriptive statistics; - about rules of registration and representation of results of statistical supervision; - on the main methods of calculation of indicators of public health (basic demographic indicators and morbidity); - about the main methods of calculation of indicators of activity of out-patient and polyclinic institutions and hospital; - formulate goals and objectives of the study; - to plan, organize and carry out statistical observation in accordance with the objectives. - use tabular and graphical methods of presentation of statistical observation materials; - to formulate conclusions arising from the results of statistical observation, and to give a General conclusion on them ; Proficiency: - public speech, argumentation, discussion and debate; - ability to expand and deepen the scientific worldview; - ability to independently acquire and use new knowledge;
10	Information Systems Software	6	Operation systems	Modeling of information systems	**Purporse:** The aim is to equip students with knowledge in the field of software information systems; formation of skills and abilities to establish client and server software; familiarity with the requirements for server programs and client programs. **Contents:** Building blocks AIS Hardware software platforms servers and workstations choice of rational software AIS Order of installation and maintenance of server software Specialized software packages and utilities administration AIS server Installation Types of server software Features of operation of different types of

					server software Installation and maintenance of client software **Expected result:** **Know:** - order of installation and maintenance of server and client software in AIS; - basic principles and software tools for the development of AIS.; **Able to:** - to install, adapt, maintain and operate standard AIS software. **Possess skills:** - the variety of tools and applications, problems and prospects of software development.
10	Programming information systems	6	Operation systems	Modeling of information systems	**Purpose:** students are mastering the C++ language and on its basis mastering the basic techniques and methods of programming and acquiring skills in modern integrated programming systems; acquisition of skills in the development of software systems; **Contents:** the Study of high-level programming techniques. Deals with the standard tasks and the typical examples from the practice of programming. Solving computational and programming problems. Object-oriented programming methodology. Dynamic data structures. **Expected result:** **Know:** -technologies of development of algorithms and programs; -methods of debugging and solving problems on a computer in different modes; -basics of object-oriented approach to programming; **Able to:** - set a task and develop an algorithm for its solution; - use application programming systems; - develop basic documents; - work with modern programming systems, including object-oriented - C++ procedural and object-oriented programming language; - know how to develop and debug programs; - methods and means of development and execution of technical documentation
11	Biostatistics	5	Medical Statistics	Expert systems in medicine	**Purpose:** Introduction. History of biostatistics. Biometric research and the modern concept of evidence-based Biomedicine. Planning of scientific research. Types of data testing of statistical hypotheses. The choice of statistical criteria for analysis of Variance. Correlation analysis.Epidemiological analysis.Survival analysis. **Contents:** Introduction. History of biostatistics . Biometric research and the modern concept of evidence-based Biomedicine. Planning of scientific research. Types of data testing of statistical hypotheses. The choice of statistical criteria for analysis of Variance. Correlation analysis .Epidemiological analysis. Survival analysis. **Expected result:** At the end of the course, students are formed: **Know:** - types of data and how they are presented; - on change scales; - on the criteria of compliance and consent; on the types Systematic errors and their evaluation in studies; - properties of the law of normal distribution signs'; - on the analysis of variance; - correlation dependence; - on the criteria for testing hypotheses; - about student t-criteria; - on the main criteria of epidemiological analysis, epidemiological indicators; - about stages of medical and biological experiment,

					planning; - survival analysis; **Able to:** -apply statistical methods of processing data's;
11	Statistical Analysis in Healthcare	5	Medical Statistics	Expert systems in medicine	**Purpose:** Introduction. History of biostatistics . Biometric research and the modern concept of evidence-based Biomedicine. Planning of scientific research. Data type. Statistical hypothesis testing. The choice of statistical criteria for analysis of Variance. Correlation analysis.Epidemiological analysis.Survival analysis. **Contents:** Introduction. History of biostatistics . Biometric research and the modern concept of evidence-based Biomedicine. Planning of scientific research. Data type. Statistical hypothesis testing. The choice of statistical criteria for analysis of Variance. Correlation analysis.Epidemiological analysis.Survival analysis. **Expected result:** At the end of the course, students are formed: **Know:** - types of data and how they are presented; - on change scales; - on the criteria of compliance and consent; on the types Systematic errors and their evaluation in studies; - properties of the law of normal distribution signs'; - on the analysis of variance; - correlation dependence; - on the criteria for testing hypotheses; - about student t-criteria; - on the main criteria of epidemiological analysis, epidemiological indicators; - about stages of medical and biological experiment, planning; - survival analysis; **Able to:** - apply statistical methods of processing data's;
12	Audit of information security	6	Fundamentals of robotics and artificial intelligence, Programming Technologies,	Database Administration in MS SQL Server platform, Administration of information systems	**Purpose:** to familiarize students with the trend of development of information security, with models of possible threats, terminology and basic concepts of the theory of information security **Contents:** Basic issues of is management. Process approach. The scope of the ISMS. The role structure of the ISMS. An ISMS policy.Riskology of IB. The main processes of the ISMS. Mandatory documentation of an ISMS. Implementation of the developed processes. Document "statement of applicability". The "business continuity Assurance" process. Ensuring compliance with the requirements of the legislation of the Republic of Kazakhstan. Operation and independent audit of the ISMS. Software tools for IB audit. **Expected result:** **Know:** - basic concepts and concepts of modern information security technologies; - basic methods of creating information security systems; - basic standards in the field of information security; basic tools for information security; **Able to:** - analyze the types of attacks and threats to information security; - formulate appropriate requirements for information security systems; - use information security tools; **Possess skills:** - the basic skills of construction and management of systems of information protection; - skills to repel typical attacks on information systems; - basic skills of working as a security administrator of computer systems;
12	Protecting information	6	Fundamentals	Database	**Purpose:** to give students the necessary knowledge,

	privacy		of robotics and artificial intelligence , Programming technologies	Administration in MS SQL Server platform, Administration of information systems	skills and abilities in the field of modern information technologies currently used, as well as information security. **Contents:** Protection of information in computer systems multi-level protection of corporate networks; protection of information in networks; requirements for information protection systems **Expected result:** **Know:** -basic concepts and trends in the protection of computer information, information security principles, classification principles and examples of security threats to computer systems; **Able to:** - configure the built-in security features in the operating system, analyze the security of the computer and the network environment using the security scanner; - install and use one of the means to encrypt information and organize data exchange using an electronic digital signature; **Possess skills:** -methods of security audit of information systems, methods of system analysis of information systems.
13	Programming languages	6	Fundamentals of robotics and artificial intelligence , Programming technologies	Database Administration in MS SQL Server platform, Administration of information systems	**Purpose: to study the discipline** **classification of programming languages, data types, operations,** **C programming language operators, program development Using subroutines, standard modules, styles** **Programming, programming quality indicators , testing program debugging methods, fundamentals of object-oriented programming** **(In Delphi), memory organization and addressing, program development , the use of pointers.** **Responsibilities:** **is the study of the basics of computer technology, improving computer skills.** **Be able to::** **- fundamentals of programming technology, programming style;** **- Standard C language functions;** **- fundamentals of object-oriented programming (in Delphi).** **Must know:** **- development of structural schemes of various algorithms;** **- data structure required depending on the requirements of the task ;** **- choice of programming language, development of programs** **to master the selected language using the means zhaks style, bagdarlamalards zhondeu zhane texeru.**
13	Programming in a high-level language	6	Mathematics 1 Mathematics 2	Methods of processing medical information/ Medical data processing software	Goal Teaching students to use the c++ language. Responsibilities To give students an idea of procedural and object-oriented programming using the c++ language. The possibility of developing hardware complexes and database components using modern tools programming tools and technologies Knowledge of the capabilities of the existing software and technical architecture. Development of evaluation and justification of the proposed solutions. In order to improve the quality of educational activities an electronic information and educational environment has been created at the university. This means organizing interaction between teachers and

					students The information and educational environment allows for interaction between participants in the educational process through the organization of remote consulting on practical tasks. Software is actively used in the process of preparing the report A Microsoft Word product. Visual Studio Community 2017 or recommended development environment after online. You can use the Visual Studio community in this way in organizations: The Visual Studio community can use an unlimited number in the following cases: in classrooms, to participate in scientific research or open source projects. For all other use cases: In unregistered organizations, Visual Studio Community can use up to 5 users. In corporate organizations (where More than 250 computers are used or an annual income of more than 1 million USA) except for the cases listed above (open source, scientific research and classrooms)
14	Modeling of information systems	5	Web технологии, Information Systems Software		**Purpose:** this discipline is an introduction to the principles of modeling complex systems that implement new information technology; study of tools for modeling the processes of information systems **Contents:** basic concepts of the theory of modeling, the current state and General characteristics of the problem of modeling systems. Prospects of development of systems modeling. Principles of system approach in system modeling. Classification of types of system modeling. The basic mathematical model diagram of information processes and systems. Network model. Modeling of parallel processes. System modeling tools. System modeling and programming languages. **Expected result:** **know:** -principles of analytical and simulation models of information processes, the main classes of models and modeling methods, methods of formalization, algorithmization and implementation of models on a computer; **Able to:** -reasonably choose a method of modeling; build an adequate model of the system or process using modern computer tools; interpret and analyze the results of modeling. **Possess skills:** - methods and techniques of work in CASE-tools; - methods and techniques of modeling information systems on modern computers based on analytical and simulation approach.; - the main criteria for the evaluation of the simulation results
14	Basics of computer modeling	5	Web технологии, Information Systems Software		**Purpose:** is the development of the theory, methods and technology of computer modeling in the study, design and application of information systems. **Content:** Introduction to the basis of computer simulation Classification of types of models simulation of random numbers simulation of random events Simulation of continuous random variables simulation of discrete random variables Organization of computer simulation. Simulation of Queuing systems Computer simulation of economic and organizational systems Expected result: **know;** - typical classes of models and methods of modeling of

					complex systems, the apparatus of the Monte Carlo method, the principles of constructing models of the processes of functioning of complex systems, methods of formalization and algorithmization; **Able to;** - use a systematic approach in the study, design and operation of information systems, to develop modeling algorithms and implement them using algorithmic languages and software packages modeling, to automate the design process with .'using modeling databases. **Possess skills**; -skills of using computer modeling tools to create psychological comfort of the user
15	Management in Healthcare	5	Public health and health , Medical statistics, Biostatistics.		**Purpose:** the Concept of management, organization, types of organization .Motivation, basic aspects of motivation. Analysis of external and internal environment. Basic principles and objectives of health planning. Power and leadership, the difference between them. Management style, views. Classification of management decisions . Methods of managerial decision-making. **Contents:** the Concept of management, organization, types of organization .Motivation, basic aspects of motivation. Analysis of external and internal environment. Basic principles and objectives of health planning. Power and leadership, the difference between them. Management style, views. Classification of management decisions . Methods of managerial decision-making. **Expected result:** **Know:** - on the basic theories of management in health care; - reasonable stages of development of management as a science and art; - about functions, about organizational structures of management in health care; - on the basic and methods of planning in the security system - public health; - on the nature, content, typology, methods of adoptionmanagement decision and algorithm of its adoption; - methods and principles of personnel management inmedical organization; - organizational, economic and financialaspects of health management; - principles of quality management in health care; **Able to:** - define goals and objectives of activitieorganization, staff of the health care system; - assess the external and internal environmentmedical organization; - apply management techniques in practicehealth care Manager activities; - use information about the health of the population andactivities of the organization to propose measures to improve the quality and effectiveness of health care; - apply information technology in management - Manager's activities in health care; - to form work plans for the organization of the collective - to apply effective communications in the health management system; - to use external and externalinternal motivation in the management of human resources in a medical organization. **Possess skills:** - basics of planning in the health care system; - basics of organization and - management in the health care system;

					- fundamentals of coordination in the health system; - fundamentals of monitoring and evaluation of results in the health system; - design of organizational structures in health care.
15	Control in Healthcare	5	Public health and health , Medical statistics, Biostatistics.		**Purpose:** the Concept of management, organization, types of organization .Motivation, basic aspects of motivation. Analysis of external and internal environment. Basic principles and objectives of health planning. Power and leadership, the difference between them. **Contents:** the Concept of management, organization, types of organization .Motivation, basic aspects of motivation. Analysis of external and internal environment. Basic principles and objectives of health planning. Power and leadership, the difference between them Management style, views. Classification of management decisions . Methods of managerial decision-making. **Expected result:** **Know:** - on the basic theories of management in health care; - reasonable stages of development of management as a science and art; - about functions, about organizational structures of management in health care; - on the basic and methods of planning in the security system - public health; - on the nature, content, typology, methods of adoption management decision and algorithm of its adoption; - methods and principles of personnel management in medical organization; - organizational, economic and financial aspects of health management; - principles of quality management in health care; **Able to:** - define goals and objectives of activities organization, staff of the health care system; - assess the external and internal environmentmedical organization; - apply management techniques in practice health care Manager activities; - use information about the health of the population and activities of the organization to propose measures to improve the quality and effectiveness of health care; - apply information technology in management Manager's activities in health care; - to form work plans for the organization of the collective - to apply effective communications in the health management system; - to use external and external internal motivation in the management of human resources in a medical organization. **Possess skills:** - basics of planning in the health care system; basics of organization and management in the health care system; - fundamentals of coordination in the health system; - fundamentals of monitoring and evaluation of results in the health system; - design of organizational structures in health care.
16	Web technologies	5	World information systems	Information technology And intelligent systems	**Objective:** to master the technologies, principles of organization and functioning of the Internet, training in the methods of designing applications for use in the Internet environment. **Content:** Principles for the development of Web documents (HTML). The role and place of Web-technologies in modern society. network Internet. Technical and software resources of the Internet. The protocols of the Internet. Internet address. Domain name

					structure. Organization of the Web site. Notepad++Editor. The simplest HTML page. Paragraphs, headings, lists. Cascading CSS style sheets. Cascading CSS style sheets. Definition of CSS. Purpose of CSS. General principles of CSS. Assigning styles. Server technology. Familiarity with the language PHP. **ult:** **Know:** - the basics of the world Wide Web; stages of development of web-sites; hypertext markup language HTML; - technology of separating content and design using cascading style sheets CSS; - modern technologies of development Web–sites; the procedure for the use of server side technologies; - principles of SEO-optimization of sites. - create static HTML pages and apply style sheets; - to use tools for creating static websites (Web-editor, graphic editor, etc.) to create interactive elements of Web-pages; to develop dynamic web-sites using modern website design technologies. **Possess skills:** - hypertext markup language for building HTML documents; - embed CSS cascading style sheets rules.
16	Programming in the Internet	5	World information systems	Information technology And intelligent systems	**Objective:** to develop students ' professional competencies related to the ability to develop applications for the Internet and develop skills in building and researching distributed applications and interactive web pages **Contents:** Introduction to Internet programming. The study of hypertext markup language HTML documents. Learning the CSS styling language. Programming in Java Script. Create client handlers. Creation of server developers. PHP programming language. Use of databases in Internet applications. Design of Internet applications for business. **Expected result:** **Know:** - methods of construction of modern Internet resources, standards in the field of development of Internet resources, formats of storage of graphic information for Internet resources, principles of construction of client and server components. **Able to:** - develop Internet applications using modern development tools **Possess skills:** - working with tools for developing and debugging client and server parts of Internet applications .
PROFILING DISCIPLINES					
Optional components (OC)					
1	Medbiophysics	5	ICT, school course of mathematics, physics, computer science.	Information and communication technologies in medicine	**Objective:** Medical physics **Contents:** description of the specialty. Medical physics is a field of applied physics in which devices, equipment and physical factors of human impact used in medicine are studied. The specialty is open to eliminate the acute shortage of personnel for health care, able to ensure the safe operation of complex medical equipment, mainly in Oncology and medical radiology. **Expected result:** At the end of the course, students are formed. **Know:** - Modern methods of studying the structure and functions of biological membranes. - Study of surface tension forces.Ionizing radiation. Dosimetry.The principles of transformation of biological and not electric signals in electric.Design of sensors and

					electrodes, their main characteristics. - The device, the principle of operation of the electrocardiograph. The main approaches to ECG recording. ECG registration and analysis principles. The device, the principle of operation of the electroencephalograph. The main EEG rhythms. EEG registration and analysis principles.Laser radiation.The device, work principle of spectrophotometer. Application of spectrophotometric research methods to determine the concentration of substances in biological fluids.Polarization of light by Biosystems. - Special techniques of microscopy of biological objects. - Model of sliding filaments. Muscle biomechanics. Hill's Equation. Simulation mytechnorati.Electromechanical coupling.Devices for measuring the function of external respiration. The device and the principle of operation. Registration and analysis of functional research data.Study of rheological properties of biological fluids. Methods of study of blood circulation. Integral and regional rheography.Methods of indirect recording of shock and minute emission. Physical basis of hemodynamics. Patterns of blood flow in the arterial and venous bed.the main technical means of medical introscopy. Physics of ionizing radiation. Photo process. Nuclear magnetic resonance. Physics of ultrasound. Physical and technical basis of radiology. The device and principles of x-ray Equipment (x-Ray, CT); ultrasound Devices; MRI Devices. Scintigraphy and radionuclide diagnostics devices. Organization of work of x-ray Department, photo laboratory. Legislative and policy materials for x-ray diagnostics. Automated accounting and reporting of the Department of LD. Bases of radiation safety in offices of LD. Dosimetric control.Therapeutic technique based on the use of direct current.Therapeutic technique based on the use of RF, microwave and UHF currents.Sources of errors in the registration of medical indicators. **Able to:** - To use physical methods of diagnosis and treatment of patients with the help of complex technical equipment, including for the safe use of sources of ionizing radiation. - The specialist prepares the appropriate equipment, plans and conducts medical irradiation of patients as prescribed by the doctor. **Possess skills:** - should be capable of conducting fundamental and applied research in the field of physical factors on the human body, ensuring radiation safety of personnel and ensuring the quality of radiation exposure of patients using sources of ionizing radiation in medicine. - To study all kinds of physical phenomena, processes and structures observed in nature - Take part in physical research - To master the method of application of research results in innovation - Process and analyze the data with the help of modern information technologies. - Operate state-of-the-art physical equipment and facilities - Participate in informational and technical organization of scientific seminars and conferences - To understand and put into practice the methods of management in the field of environmental management - Engage in sightseeing, educational and group work - Write and prepare scientific articles and reports
1	Medical physics and medical imaging.	5	ICT, school course of	Information and communication	**Objective:** Medical physics. **Content:** description of specialty

			mathematics, physics, computer science.	technologies in medicine	Medical physics is a field of applied physics in which devices, equipment and physical factors of human impact used in medicine are studied. The specialty is open to eliminate the acute shortage of personnel for health care, able to ensure the safe operation of complex medical equipment, mainly in Oncology and medical radiology. **Expected result:** - At the end of the course, students are formed. **Know:** - Modern methods of studying the structure and functions of biological membranes. - Study of surface tension forces.Ionizing radiation. Dosimetry.The principles of transformation of biological and not electric signals in electric.Design of sensors and electrodes, their main characteristics. - The device, the principle of operation of the electrocardiograph. The main approaches to ECG recording. ECG registration and analysis principles. The device, the principle of operation of the electroencephalograph. The main EEG rhythms. EEG registration and analysis principles.Laser radiation.The device, work principle of spectrophotometer. Application of spectrophotometric research methods to determine the concentration of substances in biological fluids.Polarization of light by Biosystems. - Special techniques of microscopy of biological objects. - Model of sliding filaments. Muscle biomechanics. Hill's Equation. Simulation mytechnorati.Electromechanical coupling.Devices for measuring the function of external respiration. The device and the principle of operation. Registration and analysis of functional research data.Study of rheological properties of biological fluids. Methods of study of blood circulation. Integral and regional rheography.Methods of indirect recording of shock and minute emission. Physical basis of hemodynamics. Patterns of blood flow in the arterial and venous bed.the main technical means of medical introscopy. Physics of ionizing radiation. Photo process. Nuclear magnetic resonance. Physics of ultrasound. Physical and technical basis of radiology. The device and principles of x-ray Equipment (x-Ray, CT); ultrasound Devices; MRI Devices. Scintigraphy and radionuclide diagnostics devices. Organization of work of x-ray Department, photo laboratory. Legislative and policy materials for x-ray diagnostics. Automated accounting and reporting of the Department of LD. Bases of radiation safety in offices of LD. Dosimetric control.Therapeutic technique based on the use of direct current.Therapeutic technique based on the use of RF, microwave and UHF currents.Sources of errors in the registration of medical indicators. **Able to:** - To use physical methods of diagnosis and treatment of patients with the help of complex technical equipment, including for the safe use of sources of ionizing radiation. - The specialist prepares the appropriate equipment, plans and conducts medical irradiation of patients as prescribed by the doctor. **Possess skills:** - should be capable of conducting fundamental and applied research in the field of physical factors on the human body, ensuring radiation safety of personnel and ensuring the quality of radiation exposure of patients using sources of ionizing radiation in medicine. - To study all kinds of physical phenomena, processes and structures observed in nature - Take part in physical research - To master the method of application of research results

					in innovation - Process and analyze the data with the help of modern information technologies. - Operate state-of-the-art physical equipment and facilities - Participate in informational and technical organization of scientific seminars and conferences - To understand and put into practice the methods of management in the field of environmental management - Engage in sightseeing, educational and group work - To write and execute scientific articles and reports.
2	Informatization of healthcare	5	Public health and health care	Biostatistics	**Objective:** to ensure the functioning of the industry through information and computer support of medical technologies at all levels to improve the quality of treatment and preventive care and the effectiveness of health management. **Contents:** State support of health Informatization. Integration of health Informatization-problems, prospects and challenges. Phasing the implementation of programs of Informatization of health care. The need to expand the teaching of Informatics for doctors and managers at all levels of the health system. Forecast of development of medical information technologies. Stages of implementation of Informatization in health care. **Expected result:** **Know:** - mathematical methods of solving intellectual problems and their application in medicine; - theoretical foundations of computer science, collection, storage, search, processing, transformation, dissemination of information in medical and biological systems, the use of computer information systems in medicine and health; - methods, software and technical means of medical statistics used at various stages of obtaining and analyzing biomedical information; - state standards on electronic medical history, as well as methods and means of personal data protection in medical information systems; - principles of automation of management of healthcare institutions using modern information technologies; - the main approaches to the formalization and structuring of different types of medical data used to form solutions during the diagnostic and treatment process; - algorithms and software to support decision-making during the diagnostic and treatment process. **Able to:** - use educational, scientific, popular science literature, the Internet for professional activities; - carry out text and graphic processing of medical data using standard operating system tools and common office applications, as well as application and special software; - use statistical and heuristic algorithms, methods of obtaining knowledge from the data, expert systems for diagnosis and management of treatment of diseases. **Possess skills:** - the basic technology of transforming information – text, tabular editors, search in the Internet; - the terminology associated with modern information and telecommunications technologies applied to the solution of problems of medicine and public health; - the basic technologies of information processing with the use of database management systems; - basic skills in the use of medical information systems and Internet resources for the implementation of professional tasks.

2	Information resources of healthcare	5	Public health and health care	Biostatistics	**Objective:** to Master the theoretical foundations of medical Informatics and practice of modern information and telecommunication technologies in medicine and health care. **Content:** the Information resources of health of the population. Information resources of medical and economic activities of health organizations. **Expected result:** **Know:** - the essence of the basic terms and concepts; - information gathering methods; - classification of information in medical information systems; - principles of building information systems; - areas of application of information systems in medicine and health care; - legal issues related to the storage and exchange of information in medicine and health care; - the main characteristics of computer information systems in health care. **Able to:** - identify information needs at different levels of government; - choose data sources depending on the goals and objectives of information systems; - build simple information systems to solve management issues in situational problems; **Possess skills:** - skills to assess the quality of information in information systems.
3	Multimedia Sofware	5	Medical Statistics	Biostatistics	**Objective:** to get acquainted with the existing information technologies in the field of computer graphics and acquire skills in working with modern software for designing and working with heterogeneous data (graphics, text, sound, video), organized in the form of a single information environment. **Content:** Multimedia technologies. Hardware-software and multimedia production technology. An overview of the hardware media. The main components of multimedia applications and software for their creation and processing. Technology of production of multimedia applications. Author multimedia systems. **Expected result:** **know:** - types of computer graphics; - basics of Flash Professional, tools; types of effects of vector objects; the ability to process vector text; **Able to:** - create and configure various types of animation in Flash Professional; - apply to the solution of applied tasks basic algorithms of information processing. **Possess skill:** - skills in programming in Flash Professional. - methods and means of creating modern multimedia products; basic techniques of creating, converting and editing multimedia data; - skills of combining multimedia information into a single information space.
3	Computer graphics	5	Medical Statistics	Biostatistics	**Purpose:** to Study the basic concepts of computer graphics and its application. In the study of the discipline, the student acquires the necessary knowledge to work with raster and vector graphics, which in the future can be effectively used in the study of geoinformation technologies, computer mapping and professional activities. **Contents:** Introduction to computer graphics. Raster computer graphics. Vector computer graphics. Three-dimensional computer graphics. Fractal computer graphics. Basics of Web design.

					Expected result: **Know:** - basic concepts and types of computer graphics; color models used in various types of computer graphics; - algorithms and types of compression of graphic images; basics of computer modeling; - features and applications of the studied software products; basics of web-design. **Able to:** - create and process computer graphics in an optimal way; - work with the main two-dimensional and three-dimensional graphics editors; - design web-pages in accordance with the terms of reference, using site design technology. **Possess skills:** - the main methods of creating and editing images in vector editors; skills of editing photorealistic images in raster editors.
4	Expert systems in medicine	5	Medical Statistics,Biostatisticsб Information and communication technologies in medicine	Preparation for graduate work.	**Objective:** to provide systematic assistance to medical personnel in case of controversial and problematic situations in the treatment of patients. **Contents:** Expert systems in the diagnosis of diseases. Expert system for the monitoring of the health status of the patient. Expert system for treatment planning. Expert system to predict the development of diseases. Expert systems for pattern and signal recognition. **Expected result:** **Know:** - diagnostic system; - predictive system; - planning system; - interpretative system. **Able to:** - to make quick and high-quality decisions in the field of material flow management; - to train experienced specialists in a relatively shorter period of time; to maintain the "know-how" of the company, as the personnel using the system cannot take out the experience and knowledge contained in the expert system; - to use the experience and knowledge of highly qualified specialists in non-prestigious, dangerous, boring and similar jobs. **Possess skills:** - knowledge of data objects specific to the subject area; - knowledge of data types specific to the method of knowledge representation; - - knowledge independent of the method of representation.
4	Information and computing expert systems in medicine Information and computing expert systems in medicine	5	Medical Statistics,Biostatisticsб Information and communication technologies in medicine	Production preparation for diploma work	**Objective:** to Create a single information space; to Monitor and manage the quality of medical care; To increase the transparency of medical institutions, as well as the effectiveness of management decisions; to Study the economic aspects of medical care; to Reduce the time of examination and treatment of patients; **Contents:** basic level Medical information systems. Medical information systems at the level of medical institutions. Medical information systems of territorial level. Medical information systems at the Federal level. **Expected result:** **Know:** -definition of information system, tasks of medical information systems, classification, functional purpose of medical information systems, the concept of an automated control system, its levels, components, structure, functions, basic requirements, as well as stages of development. **Able to:** -to make and analyze the structural scheme of the

					program complex of the automated hospital information system of the offered medical and preventive institution; -to enter information about patients treated in the Hospital as; -create a consolidated and personalized account-register for mutual settlements with the insurance medical organization in the as Hospital; **Possess skills:** -terminology related to modern computer technologies in the application to solving problems of medicine and health care; -the main methods for the use of medical information systems in the diagnostic and treatment process.
5	Mathematical methods of evidence-based medicine	4	Medbiophysics	Production preparation for diploma work	**Purpose:** to Study the basic concepts of computer graphics and its application. In the study of the discipline, the student acquires the necessary knowledge to work with raster and vector graphics, which in the future can be effectively used in the study of geoinformation technologies, computer mapping and professional activities. **Contents:** Introduction to computer graphics. Raster computer graphics. Vector computer graphics. Three-dimensional computer graphics. Fractal computer graphics. Basics of Web design. **Expected result:** **Know:** - basic concepts and types of computer graphics; color models used in various types of computer graphics; - algorithms and types of compression of graphic images; basics of computer modeling; - features and applications of the studied software products; basics of web-design. **Able to:** - create and process computer graphics in an optimal way; - work with the main two-dimensional and three-dimensional graphics editors; - design web-pages in accordance with the terms of reference, using site design technology. **Possess skills:** - the main methods of creating and editing images in vector editors; skills of editing photorealistic images in raster editors.
5	Mathematical processing of experimental data	4	Medbiophysics	Production preparation for diploma work	**Purpose:** Development of scientific basis for building automated information processing and management systems. Development of theoretical bases of algorithmization of functional problems of information management and processing, analysis of ACS efficiency. Development of fundamentally new methods of organization and maintenance of information database and data banks. Development of methods of transformation and transmission of information in automated systems of information processing and management. Development of real-time systems in the field of organizational management and information processing. Development of methods of control, coding and ensuring the reliability of information. Creation of computer systems and information transmission networks. Development of multimedia systems and complex applications. Development of scientific bases of technical support of ACS. Development of methods to ensure system compatibility and integration of ACS, APCS. **Contents:** Automated information systems: basic concepts and terminology, classification. Functioning of automated information systems. Automated control system. **Expected result:** **Know:** - regulatory framework for the development and

					preparation of technical documentation; - methods of design of automated information systems; - typical components of automated information systems; - features of operation of computer networks of different types; - principles of construction of distributed information systems; - software composition of automated information systems; - methods of information security of automated information systems; - the methodology of improvement of technological solutions; - basic methods of quality management of products and services; - methods of evaluation of quality and reliability of products; - the procedure for certification of products and services; General principles of personnel management. **Able to:** - develop technological processes of automated information processing, develop, modify, adapt and maintain components of automated information systems; - to install, adapt, maintain and operate the software of automated information systems; - to carry out the optimal choice of information software and hardware in the formation and modification of automated information systems; - to operate automated information systems; - ensure compatibility of hardware and software protection of computer equipment; - to develop instructional documentation for support of automated information systems; **Possess skills:** - methods of analysis of the subject area and design of pric- - handsome of the information processing system; - the ability and skills of selection and verification of different protocols - levels of architecture of the digital network of integrated service, methods of an assessment of efficiency of concrete options of integrated networks; - methods a systematic analysis of the interfaces of the information processing system.
6	3D modeling in medicine	4	Informatization of healthcare	Production preparation for diploma work	**Objective:** to provide students with basic training in project management. To give an idea of the existing methodologies of project management in the field of it and to develop students ' practical skills in their application, so that at the end of one semester of training they were able to prepare and perform at a qualitative level their first project. **Contents:** Introduction to project management. Evaluation method. Preparation of the project plan. Project risk management. Financial justification of the project. Control and monitoring. Schedule management. Fundamentals of the theory of constraints. Integration management. Resource management. Quality management methods. Project team management. Multi-project and portfolio management. **Expected result:** **Know:** - project life cycle models; XP methodology; - PMI standard basics; - quality control methods; - team building methodologies; - methods of formalization and decision-making; **to be able to:** - manage project communications; manage project personnel;

					- plan and manage deadlines; identify and reduce risks; **topossess:** skills of working with project management SOFTWARE; - methods of creating project plans; - methods of analyzing project schedule bottlenecks; - methods of schedule management.
6	Graphic images in medicine and health care	4	Informatization of healthcare	Production preparation for diploma work	**Purpose:** development of basic and management of information technologies. **Contents:** Management and Informatics; General principles of the system organization; stability, controllability and observability; invariance and sensitivity of control systems; mathematical models of objects and control systems; forms of representation of models; methods of analysis and synthesis of control systems. Digital control systems; software implementation of control algorithms in digital systems. **Expected result:** **Know:** - the Essence and methods of business communication. Structure of business negotiations, Rules and form of business correspondence. The nature and types of electronic communications **Able to:** - Rules and form of business correspondence. - Justifies his point of view; - evaluates other opinions on the topic under discussion. Uses the presented tools. **Possess skills:** - Presents the results of the research in the form of a scientific report; - competent oral and written speech with the use of special project and business terminology
7	Administration of information systems	5	Information security and information security	Production preparation for diploma work	**Purporse:** to provide students with the necessary knowledge and skills in the field of means and methods of administration of IP currently used; mastery of theoretical knowledge in the field of information resources management of systems and networks; the acquisition of applied knowledge about the objects and methods of administration in information systems; to master skills of independent use of tool software systems, network services and equipment for the administration of IP. **Contents:** virtual machines and administration. The main tasks of administration. The concept of users and groups. NTFS. Automation of administration tasks. The basics of linux. Linux file system. Security FS. Network protection in linux. DNS. DHCP service. Application launch control. System restore. Selinux security system. Linux and windows interaction. **Expected result:** **Know:** - concepts, definitions of Active Directory; - the law of information exchange technology transfer; standards of data implementation of other applications; **Able to:** - organize the work of information systems; - ensure the security of data transmission; - choose measures and methods of organization of interaction of elements of information system in accordance with the tasks; **Possess skills:** - methods of practical use of modern computers for information processing; - ability to automate common tasks of administration; - ability to enter, store, process and analyze information.
7	Automated systems for information processing and control	5	Information security and protection	Production preparation for diploma work	**Purpose:** Development of scientific basis for building automated information processing and management systems. Development of theoretical bases of

					algorithmization of functional problems of information management and processing, analysis of ACS efficiency. Development of fundamentally new methods of organization and maintenance of information database and data banks. Development of methods of transformation and transmission of information in automated systems of information processing and management. Development of real-time systems in the field of organizational management and information processing. Development of methods of control, coding and ensuring the reliability of information. Creation of computer systems and information transmission networks. Development of multimedia systems and complex applications. Development of scientific bases of technical support of ACS. Development of methods to ensure system compatibility and integration of ACS, APCS. **Contents:** Automated information systems: basic concepts and terminology, classification. Functioning of automated information systems. Automated control system. **Expected result:** **Know:** - regulatory framework for the development and preparation of technical documentation; - methods of design of automated information systems; - typical components of automated information systems; - features of operation of computer networks of different types; - principles of construction of distributed information systems; - software composition of automated information systems; - methods of information security of automated information systems; - the methodology of improvement of technological solutions; - basic methods of quality management of products and services; - methods of evaluation of quality and reliability of products; - the procedure for certification of products and services; General principles of personnel management. **Able to:** - develop technological processes of automated information processing, develop, modify, adapt and maintain components of automated information systems; - to install, adapt, maintain and operate the software of automated information systems; - to carry out the optimal choice of information software and hardware in the formation and modification of automated information systems; - to operate automated information systems; - ensure compatibility of hardware and software protection of computer equipment; - to develop instructional documentation for support of automated information systems; **Possess skills:** - methods of analysis of the subject area and design of pric- - handsome of the information processing system; - the ability and skills of selection and verification of different protocols - levels of architecture of the digital network of integrated service, methods of an assessment of efficiency of concrete options of integrated networks; - methods a systematic analysis of the interfaces of the information processing system.
8	Methods of medical	5	Information	Production	**Purpose:** students Acquire knowledge of modern

	information processing		security and information security	preparation for diploma work	computer technologies in medicine. **Contents:** Medical information systems and technologies. Basic concepts of medical information systems. Medical information systems, classification of medical information systems, the main types of medical information systems, the principles of operation and functioning of various systems. Medical information technology. Medical hardware and software systems, Telemedicine, Intelligent systems in medicine. **Expected result:** **Know:** - how to search, store, process and analyze information from various sources and databases, present it in the required format using information, computer and network technologies; **Able to:** - search, store, process and analyze information from various sources and databases, present it in the required format using information, computer and network technologies; **Possess skill:** - the ability to search, store, process and analyze information from various sources and databases, to present it in the required format using information, computer and network technologies.
8	Medical data processing software	5	Information security and information security	Production preparation for diploma work	**Objective:** to Master students ' knowledge in the use of medical information systems and the acquisition of skills of intellectual activity, which will allow them to comprehensively approach the analysis and resolution of problems of future professional activity. **Contents:** Computer monitoring of electrophysiological parameters in physiotherapy. Organization of competition between the processes of medical information processing. Modern architecture of computer operating systems and networks used in medical research. Network protocol. Coordination of computer actions. Improving the reliability of medical data transmission in computer networks using finite fields. Parallelization of information processing processes in modern computers to increase the speed of information processing in medical research. Methods of organization of experimentally obtained medical data in modern computers Network model of medical data. Hierarchical model of medical results. Artificial neural networks used for computer intellectualization in medical research. Methods of protection of medical information from unauthorized access. Methods of computer processing of medical experiment results on the basis of mathematical statistics. Devices for input and output of analog medical information from status sensors. Internet technologies in scientific research. **Expected result:** **Know:** - system bases for formalization of medical problems and processes; - methods of medical data processing; - regularities of construction, functioning and development of medical systems and technologies; - principles and methods of implementation of medical systems and technologies; - main types of medical information systems and technologies used in practice. **Able to:** - apply basic medical information systems and technologies in scientific and practical activities, identify problems relevant to diagnostic, therapeutic, rehabilitation processes; - use methods and principles of processing, management for the analysis of medical problem

					situations; - develop complexes of formalization and management of medical information; - apply the knowledge to solve scientific and applied problems. **Possess skill:** - skills of work with medical information systems and technologies used in this subject area.
9	Data since and neural networks in medicine	5	Modern medical information systems and telemedicine/ Information systems of medical technological processes	Writing and defending a thesis (project) or passing a state exam in two specialized disciplines	**Data Scientist analyzes large amounts of data, predicts events and helps to find fuzzy patterns. With the help of machine learning, it can diagnose, detect diseases and personalize treatment.--- The training consists of webinars and pre-recorded video courses. We take into account the requirements of employers and update the program annually.---- You will learn how to solve business problems using machine learning. After training, you will have 12 cases in your portfolio.----- You work with medical data, analyze drug research, get acquainted with the labor market. In this case, you can start working before specialization.---- Data science in medicine: cardio-MRI with AI, smart planning of radiation therapy and random detection of diseases----daily search queries — Internet activity has become a great source of information called Big Data. But today, big data analysis plays an important role in medicine, helping doctors to diagnose, randomly identify diseases and accurately calculate the parameters of radiation therapy. Employees of the Philips Research laboratory in Skolkovo talked about how big data analysis is changing healthcare and what projects the Philips laboratory is implementing in the field of Data science.**
9	Big Data	5	Modern medical information systems and telemedicine/ Information systems of medical technological processes	Writing and defending a thesis (project) or passing a state exam in two specialized disciplines	**Objective: to form the necessary theoretical base and practical skills that allow a comprehensive and systematic understanding of the problems of information processing and analysis, as well as to develop and analyze conceptual and theoretical models for solving scientific and applied problems in the field of information technology. One of the main problems of modern data processing and analysis is data growth, so this discipline is designed for processing large amounts of data. The main objective of the course is to form a holistic view of modern problems of big data analysis and processing, to help in mastering the practice of developing and analyzing conceptual and theoretical models of applied big data analysis problems using Data Mining models.----** **Know:** *** methods for solving big data processing and analysis problems, the capabilities of high-performance computing systems, distributed computing technologies, Data Mining methods and models.** *** development and analysis of conceptual and theoretical models of applied big data analysis tasks;** *** application and application of deep knowledge in the field of big data processing and analysis;** *** estimation of time and necessary hardware resources for solving data analysis and processing tasks;** *** Creation of algorithms for analyzing and processing large amounts of data using Data Mining models.** **Have (possess) skills and (or)work experience:** *** skills in using software systems for big data analysis.**

LIST OF COMPONENTS BY CHOICE
6B06123 IT in HEALTHCARE
Training period: 4 years

Group educational programs: 5B057 Information technology

Name of discipline	Code of discipline	Number of credits	Semester
Component of choice 1			
Module of economic and legal knowledge		5	2
Fundamentals of market economy and entrepreneurship	FMEE1111	3	
Fundamentals of law and anti-corruption culture	FLACC1112	2	
Component of choice 2		2	
Module of economic and natural knowledge		5	2
Fundamentals of market economy and entrepreneurship	FMEE111	3	
Fundamentals of safety and life	FSL1112	2	
Basic disciplines			
Component of choice 1			
Databases in IP	WIS 2210	5	3
Database concept	WIR 2210		
Component of choice 2			
Operation systems	OS 2211	5	3
Operating systems and PC software	OSPCS 2211		
Component of choice 3			
Fundamentals of robotics and artificial intelligence	FRAI 2212	6	4
Robotic systems and complexes	RSC 2212		
Component of choice 4			
Public health and health	PHH 2213	6	3
Social Medicine	SM 2213		
Component of choice 5			
Information and communication technologies in medicine	ICTM 2214	6	4
Medical informatics	MI 2214		
Component of choice 6			
Computer-aided design systems in medicine	CADSM 3215	5	5
Automation of production	AP 3215		
Component of choice 7			
Programming Technologies	PT 3216	5	5
Programming of databases	PD 3216		
Component of choice 8			
Medical electronics	ME 3217	5	5
Basics of designing medical devices and systems	BDMDS 3217		
Component of choice 9			
Medical Statistics	MS 3218	5	5
Statistics of healthcare system	SHS 3218		
Component of choice 10			

Information Systems Software	ISS 3219	6	6
Programming information systems	PIS 3219		
Component of choice 11			
Biostatistics	Bio 3220	5	6
Statistical Analysis in Healthcare	SAH 3220		
Component of choice 12			
Audit of information security	AIS 3221	6	6
Protecting information privacy	PIP 3221		
Component of choice 13			
Programming languages	DS 3222	6	6
Programming in a high-level language	CD 3222		
Component of choice 14			
Modeling of information systems	MIS 4223	5	7
Basics of computer modeling	BCM 4223		
Component of choice 15			
Management in Healthcare	MH 4224	5	7
Control in Healthcare	CH 4224		
Компонент по выбору 16			
Web технологии	WT4225	3	7
Программирование в Интернет	PI4225		
Profiling disciplines			
Component of choice 1			
Medbiophysics	Med 2305	5	3
Medical physics and medical imaging.	MPMI 2305		
Component of choice 2			
Informatization of healthcare	IZ 3306	5	5
Information resources of healthcare	IRZ 3306		
Component of choice 3			
Modern medical information systems and telemedicine	SMIST 3307	5	6
Information systems of medical technological processes	ISMTP 3307		
Component of choice 4			
Expert systems in medicine	ESM 4308	5	7
Information and computing expert systems in medicine	ICESM 4308		
Component of choice 5			
Mathematical methods of evidence-based medicine	MMEBM 4309	4	7
Mathematical processing of experimental data	MPED 4309		
Component of choice 6			
3D modeling in medicine	3DMM 4310	4	7
Graphic images in medicine and health care	GIMHC 4310		
Component of choice 7			
Administration of information systems	AIS 4311	4	7
Automated systems for information processing and control	ASIPC 4311		

Component of choice 8			
Methods of medical information processing	MMIP 4312	5	8
Medical data processing software	MDPS 4312		
Component of choice 9			
Data since and neural networks in medicine.	ADMSSQLSP 4313	5	8
Big Data	TAC 4313		