

**MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN  
"NJSC "S. SEIFULLIN KAZAKH AGROTECHNICAL UNIVERSITY"**

Approve  
NJSC "Saken Seifullin Kazakh  
Deputy Chairman of the Management  
Board Academic Activity-Rector  
\_\_\_\_\_ A.M Abdyrov.  
« \_\_\_\_\_ » \_\_\_\_\_ 2021.

**CATALOG OF ELECTIVE COURSES**

For students in groups of educational programs

6B06102 - Business Informatics

**Nur-Sultan, 2021**

**MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN  
"NJSC "S. SEIFULLIN KAZAKH AGROTECHNICAL UNIVERSITY"**

Brief description of elective disciplines of the educational program

Veterinary hygiene

1	Name of course	Basics of economics and law
2	Code of course	OEP 2118
3	Cycle of course	ООД
4	Amount of credits	5
5	Level of preparation	Undergraduate
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	Political Science and Sociology, Contemporary History of Kazakhstan
9	Postrequisites	Business Statistics, Econometrics for Business Solutions
10	Course summary	Fundamentals of social production and forms of social economy. The mechanism of functioning of the market system. Production, costs and income of the company. National economy. Economic growth and market instability. Inflation and unemployment are a manifestation of economic instability. Fundamentals of the theory of state and law, constitutional law, administrative law, civil law, labor law, family law, criminal law.
11	Learning outcomes	To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future

1	Name of course	Mathematical foundation of information technologies
2	Code of course	MOIT 1201
3	Cycle of course	БД
4	Amount of credits	5
5	Level of preparation	Undergraduate
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	School course in mathematics and physics
9	Postrequisites	Discrete mathematics applications and numerical methods, Probability and statistics in computer science, Algorithms and data structures
10	Course summary	Methods and typical problems of linear algebra, vector algebra, analytic geometry, differentiation of functions of one variable, integration of functions of one variable, differentiation of functions of several
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information.

1	Name of course	Discrete mathematics applications and numerical methods
2	Code of course	PDMChM 1202
3	Cycle of course	БД
4	Amount of credits	7
5	Level of preparation	Undergraduate
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	Mathematical Foundations of Information Technology
9	Postrequisites	Probability and Statistics in Computer Science, Algorithms and Data Structures
10	Course summary	Elements of mathematical logic. Boolean functions. Sets and ways of their task. Operations on sets. Cartesian factors. Combinatorics. Binomials. Fundamentals of graph theory. Ways to set graphs. Elements of coding theory. Hamming code. Elements of the theory of errors. Solutions of linear and nonlinear equations. Interpolation and approximation, simplex method, Transport problem, elements of the theory of matrix games.
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information.

1	Name of course	Probability and Statistics in Computer Science
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2	Code of course	VSKN 1203
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	Mathematical Foundations of Information Technology
9	Postrequisites	Business Statistics, Statistical Software Packages
10	Course summary	Methods and typical problems of probability theory: random events, probability of a random event, discrete random variables, their characteristics, continuous random variables, their characteristics, distribution laws, elements of the correlation theory, the law of large numbers. Methods and typical problems of mathematical statistics: the basics of the selective method and elements of the statistical theory of estimation, statistical study of dependence, methods of statistical testing of hypotheses.
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information.

1	Name of course	Educational practice
2	Code of course	UP 1204
3	Cycle of course	BD
4	Amount of credits	1

5	Level of preparation	Undergraduate
6	Department	Information and communication technology
7	Year	
8	Prerequisites	Information and communication technology
9	Postrequisites	Algorithmization and programming, programming technology
10	Course summary	Acquaintance with the organizational structure of the university, with the organization of the educational process; tour of the educational buildings and classrooms; familiarization with the functions and contents of the work; familiarization with safety in classrooms; familiarization with regulatory and technical documentation; preparation of a report on practice. Basics of programming. Branching algorithms. Cycles. Data arrays. Functions Strings and characters. Files.
11	Learning outcomes	Apply basic information processing algorithms to solving applied problems, assess the complexity of algorithms, program and test applications.

1	Name of course	Internship
2	Code of course	PP 2208
3	Cycle of course	BD
4	Amount of credits	3
5	Level of preparation	Undergraduate
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	Data Management, Python Programming / Java Programming / C / C ++ Programming, Software Design
9	Postrequisites	Course and diploma design

10	Course summary	Issuance of tasks, paperwork. Safety briefing (general). Safety study and instruction at the workplace. Familiarization with the activities of the organization / enterprise. Fulfillment of production tasks for automation and / or software development. The study of theoretical material. Independent work with literature and technical documentation. Collection, processing, systematization and analysis of factual and literary materials.
11	Learning outcomes	Apply basic information processing algorithms to solving applied problems, assess the complexity of algorithms, program and test applications. Use communication protocols in the network; the ability to build websites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at various phases of the life cycle of software systems. Apply basic software testing techniques and programs

1	Name of course	Internship
2	Code of course	PP 3212
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	Programming in Python/ Programming in Java/ Programming in C/C++/C#, Designing software systems
9	Postrequisites	Course and diploma design
10	Course summary	Issuance of tasks, paperwork. Safety briefing (general). Safety study and instruction at the workplace. Familiarization with the activities of the organization / enterprise. Fulfillment of production tasks for automation and / or software development. The study of theoretical material. Independent work with literature and technical documentation. Collection, processing, systematization and analysis of factual and literary materials.

11	Learning outcomes	Apply basic information processing algorithms to solving applied problems, assess the complexity of algorithms, program and test applications. Use communication protocols in the network; the ability to build websites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at various phases of the life cycle of software systems. Apply basic software testing techniques and programs
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1	Name of course	Pregraduation practice
2	Code of course	PP 4307
3	Cycle of course	BD
4	Amount of credits	10
5	Level of preparation	Undergraduate
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	Programming in Python/ Programming in Java/ Programming in C/C++/C#, Designing software systems
9	Postrequisites	Project work
10	Course summary	Issuance of tasks, paperwork. Safety briefing (general). Safety study and instruction at the workplace. Familiarization with the activities of the organization / enterprise. Fulfillment of production tasks for automation and / or software development. The study of theoretical material. Independent work with literature and technical documentation. Collection, processing, systematization and analysis of factual and literary materials.
11	Learning outcomes	Apply basic information processing algorithms to solving applied problems, assess the complexity of algorithms, program and test applications. Use communication protocols in the network; the ability to build websites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at various phases of the life cycle of software systems. Apply basic software testing techniques and programs



1	Name of course	Leadership and team management
2	Code of course	LUK 2213
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	
8	Prerequisites	Political Science and Sociology
9	Postrequisites	Business Economics, Project work
10	Course summary	Leader Function. Types of teams. Group thinking and group pressure as ways to influence its participants. Technologies of self-actualization and increasing the effectiveness of a leader. Planning as a function of a leader in an organization. Psychological mechanisms of promotion to a leadership position. The process of formation and development of a social group. Tools for managing the socio-psychological climate in a team. Management decisions of a team leader.
11	Learning outcomes	It is logically correct, reasoned and clear to construct oral and written speech in the native / foreign language in an appropriate range of social and cultural contexts. To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future

1	Name of course	Business Statistics
2	Code of course	BS 2214
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Internet Application Development, Business Economics, Cloud and Mobile
9	Postrequisites	Fundamentals of the Digital Economy, Project Work
10	Course summary	Subject and methods of statistics. Statistical observation, systematization of data and their presentation. Statistical grouping, tables. Absolute and relative indicators, their graphic representation. Average values and indicators of variation. Selective method in statistical studies. Statistical hypothesis testing. Random variables and probabilistic models. A statistical study of the dynamics of business processes. Economic indices. Statistical study of the relationship of social phenomena.
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information. To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes in society, and predict their possible development in the future

1	Name of course	Statistical Packages
2	Code of course	PSP 2228
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Information and Communication Technologies, Probability and Statistics in Computer Science
9	Postrequisites	Business Economics, IT Marketing
10	Course summary	Studying the interface of statistical software (software). General mathematical and special statistical graphs, methods for constructing and editing them. Sample characteristics, Student and Fisher criteria, one-way analysis of variance, correlation analysis, Chi-square uniformity and conjugacy criteria. Calculation of sample characteristics, construction of a histogram and EGF. Regression analysis. Cluster analysis.
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information. To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes in society, and predict their possible development in the future

1	Name of course	Econometrics for business solutions
2	Code of course	EDBR 2216
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Information and Communication Technologies, Mathematical foundation of information technologies, Fundamentals of Economics and Law, Business Statistics
9	Postrequisites	Business Process Analysis, Data Analysis
10	Course summary	The subject and methods of econometrics. The characteristic of interconnections. The main stages of building an econometric model. Methods for selecting factors. Estimation of model parameters. Examples of econometric models. Paired regression analysis. Construction of the regression equation. Model specification. Estimation of parameters of nonlinear models. Correlation coefficients. Communication score. Point and interval prediction according to the linear regression equation. Coefficient of elasticity. Multiple Regression Analysis.
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information. To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes in society, and predict their possible development in the future

1	Name of course	Game theory
2	Code of course	TI 2229

3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Information and communication technologies, Mathematical foundations of information technology, Probability and statistics in computer science
9	Postrequisites	System analysis and decision making, project work
10	Course summary	Classification and presentation of games. Formalization of decision making. The expanded and normal form of the game. Antagonistic games. The principle of minimax. Defensive and balanced strategies. The concept of a mixed strategy. Graphic method for solving games. Solving games using linear programming. Iterative Method Games with full and incomplete information. Endless games. Cooperative games. Billing Set. Pareto Optimality.
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analyzing and organizing information

1	Name of course	Business process analysis
2	Code of course	ABP 3221
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology

7	Year	3
8	Prerequisites	Fundamentals of Economics and Law, Business Statistics
9	Postrequisites	Data Analysis, Business Economics
10	Course summary	Classification and elements of business processes. Stages and methods of modeling business processes. Building a system of analytical indicators for managing business processes. Current and normative models of the business process. Cost and cost models of a business process. Risk analysis. The main types of projects to optimize business processes. Methods for making and adjusting business decisions in the face of uncertainty.
11	Learning outcomes	Apply the basic methods of natural science disciplines in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information. To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes in society, and predict their possible development in the future

1	Name of course	Business economics
2	Code of course	EP 3211
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Fundamentals of Economics and Law, Business Statistics
9	Postrequisites	ICT Markets and Sales Organization, E-Business, IT Project Management

10	Course summary	Entrepreneurship: the concept, essence, types and forms. The resource potential of the organization. Standardization and remuneration of labor. Costs, financial results of activity. Economic efficiency of activity of the organization and entrepreneurial projects. Marketing and management of the organization. State support for entrepreneurship. Business planning. Organization of entrepreneurial transactions. Responsibility of actors. Risks in entrepreneurial activity. Trade secrets and ways of protecting them. Termination of entrepreneurial activity.
11	Learning outcomes	To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future.

1	Name of course	IT marketing
2	Code of course	IM 4309
3	Cycle of course	PD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Programming Technology, Business Process Analysis
9	Postrequisites	IT project management, Project work, diploma project
10	Course summary	IT marketing as a specialized marketing area. The role of marketing in building a business. Types of IT projects, company life cycle. Segmentation, analysis and selection of target segments. The concept of competition, analysis of competitors, sources of information. Using the results of marketing decisions to make a positioning decision. Features of pricing for software products. The most popular monetization models of IT products. Sales policy for IT companies.

11	Learning outcomes	To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes in society, and predict their possible development in the future. Design objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conduct a feasibility study of design solutions and presentation of work results
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1	Name of course	ICT Markets and Sales Organization
2	Code of course	RIOP 4311
3	Cycle of course	PD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Programming Technology, Business Statistics
9	Postrequisites	IT project management, Project work, diploma project
10	Course summary	Production technologies and market analysis of information products and services. The world's leading IT manufacturers, suppliers of IT products and IT services, their business development directions, features and current state of the IT market. The dynamics of supply and demand in the IT-market of Kazakhstan. Ways to promote an IT company, information product or service on the IT market; conducting marketing research, collection, systematization and processing of information.
11	Learning outcomes	To classify the patterns of development of economics and law. Analyze the state and trends of socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes in society, and predict their possible development in the future. Design objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conduct a feasibility study of design solutions and presentation of work results



1	Name of course	Algorithms and data structures
2	Code of course	ASD 2205
3	Cycle of course	BD
4	Amount of credits	6
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Information and communication technologies, Mathematical foundations of information technology, Discrete mathematics applications and numerical methods
9	Postrequisites	Programming Technology, Programming in Python / Programming in Java / Programming in C / C ++
10	Course summary	Introduction to Algorithms. The concept of an algorithm, the structure of algorithms: linear, branching, cyclic. Sorting algorithms, Shell algorithm, search algorithms, recursive algorithm. Formal languages and grammars, Turing machine automata, data and their types. Data structure: array, sets, records, stack, queue, linked list, tree, graph, prefix tree, hash table, file. Compression Algorithm - Huffman Algorithm, Euclidean Algorithm.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications.

1	Name of course	Information Processes, Systems and Networks
2	Code of course	IPSS 2215
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Information and communication technologies, Mathematical foundations of information technology
9	Postrequisites	Internet Application Development, Software Design, Fundamentals of Neural Networks
10	Course summary	The basic principles of building computer networks. Network architectures. Hardware components of computer networks. Network models. Protocols Addressing in networks. Interworking. Information Systems. Information extraction: main phases. Forms and methods of data research. Information search methods on the Internet based on information retrieval systems. Transportation of information. OSI reference model.
11	Learning outcomes	Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs. Determine the purpose and main components of database systems, the basic concepts of the relational data model. Build a conceptual model of a given subject area; apply database design techniques to solve practical problems in the field of corporate information systems.

1	Name of course	Programming Technology
2	Code of course	TP 2207
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Information and Communication Technologies, Algorithms and Data Structures
9	Postrequisites	Python Programming / Java Programming / C / C ++ Programming, Requirement Development and Software Testing
10	Course summary	The life cycle of a software product. Software architecture (software). Development models, technologies. Software structure design. Programming paradigms: visual, functional, procedural, object-oriented, etc. Technology for creating software code, distributed computing, collective software development. Software tools for planning and managing the development process. Methods of debugging and testing programs. Documentation and quality assessment of software products.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications.

1	Name of course	C / C ++ Programming
2	Code of course	PC 2217
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Algorithms and data structures, programming technology
9	Postrequisites	Software Design, Cloud and Mobile
10	Course summary	Variables, constants and expressions. Basic data types. Standard features. The operators. Components. Basic preprocessor directives. Programming tasks of linear, branching, cyclic structures in console mode and with components in a programming environment. Arrays Array sorting. Work with files. User Features Global and local variables. Structures. Pointers. Reference data type. Creating dynamic variables. Graphic arts.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs.

1	Name of course	Internet Application Development
2	Code of course	RIP 2218
3	Cycle of course	BD

4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Data management
9	Postrequisites	Requirement development and software testing
10	Course summary	Classification of Internet technologies. Client and server Internet technologies. Hypertext preprocessors. Ways to interact with the database. Hypertext preprocessor php. Using a preprocessor with a web server. The possibility of forming graphic images. Site management systems. Controls and system interface. Learning the principles and techniques of work in a visual editor. Information blocks. Web site templates. Security Considerations for Using Internet Applications.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs.

1	Name of course	Programming in Java
2	Code of course	PYaJ 2219
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Algorithms and data structures, programming technology

9	Postrequisites	Software Design, Cloud and Mobile
10	Course summary	Development environments for Java. The syntax of the language. Data types. The operators. Control structures. Arrays Abstraction. Objects Abstract classes. Interfaces Access control. Encapsulation, inheritance and polymorphism. Error handling and exceptions. Interfaces Events. Libraries Layout controllers. Work with network protocols. Work with databases. Sound and graphics. Remote method call. Creating graphical applications.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs.

1	Name of course	Programming in Python
2	Code of course	PYaP 2220
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Algorithms and data structures, programming technology
9	Postrequisites	Software Design, Cloud and Mobile
10	Course summary	Basic concepts and syntactic constructions. The operators. Data types. Conditional statements, while and for statements. Design blocks of code. Functions, arguments, return values. Modules and libraries. Reading and writing files. Data structures. Arrays, addressing array elements, functions for working with arrays, slices of arrays. Python Standard and Custom Modules.

11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs.
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1	Name of course	Fundamentals of Information Design and Visualization
2	Code of course	OIDV 3222
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Information and communication technology
9	Postrequisites	Cloud and mobile technologies, IT project management, Project work
10	Course summary	Basic concepts of information design. Create presentations. Classification of infographics. General characteristics of tools for creating infographics. Create graphical models in Excel and Google Spreadsheets. Signs and data visualization, curly diagrams. Composition of building graphic schemes. Online infographic tools. Infographics as a means of visualizing economic information and as a marketing and advertising tool. Intelligence cards.
11	Learning outcomes	Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.

1	Name of course	Software Design
2	Code of course	PPS 3210
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Python Programming / Java Programming / C / C ++ Programming, Data Management
9	Postrequisites	Development of requirements and software testing, Design work
10	Course summary	Software design goals (software). Software Design Sequence. Unified modeling language UML. The main diagrams. Requirements analysis. Analysis classes. State diagrams (state machines). Software Architecture Quality assessment of software system architectures. Detailed software design. Design classes. Design patterns. Using components in software design. Design in concrete classes and design in interfaces.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs. Determine the purpose and main components of database systems, the basic concepts of the relational data model. Build a conceptual model of a given subject area; apply database design techniques to solve practical problems in the field of corporate information systems.



1	Name of course	Labor protection and basics of life safety
2	Code of course	OTOBZh 3223
3	Cycle of course	BD
4	Amount of credits	2
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	-
9	Postrequisites	Project work
10	Course summary	The principles of the organization of labor protection at the enterprise, the tasks and functions of the labor protection service, methods and methods for their implementation, creating a safe human environment, the formation of a technosphere comfortable for human life and work, minimizing the technogenic impact on the natural environment, preserving human life and health through the use of technical means, methods of control and forecasting.
11	Learning outcomes	Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.

1	Name of course	Requirements Development and Software Testing
2	Code of course	RTTPO 3225
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Programming Technology, Internet Application Development, Data Management
9	Postrequisites	Project work
10	Course summary	An introduction to the design and architecture of software systems from the perspective of identifying requirements. Design concepts. Object-oriented design using UML in the context of requirements analysis. Designing the behavior of systems, their interaction. Documentation of design decisions. Transition from design solutions to program code. Place of testing in the software development life cycle. Test Design Testing Support Tools.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs. Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.

1	Name of course	Cloud and mobile technologies
2	Code of course	OMT 3227
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Python Programming / Java Programming / C / C ++ Programming, Internet Application Development
9	Postrequisites	Project work, graduation project
10	Course summary	Cloud computing. Service models in cloud computing. Classification of stages of development of virtualization technologies. Cloud architecture. Distributed information and communication platform architecture. User interaction with the platform. The virtualization subsystem of infrastructure resources in the cloud. The structure of the Android / iOS project. General management of settlements. Mobile carrier cloud technologies, modular and Blade servers. Creating user interfaces.
11	Learning outcomes	Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs.

1	Name of course	IT Services and Content Management
2	Code of course	UISK 3302
3	Cycle of course	PD
4	Amount of credits	6
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Information and communications technology, Internet application development
9	Postrequisites	IT Marketing, Basics of the Digital Economy, Project Work
10	Course summary	Management of information resources and content. General concepts of IT services: definition, business value, usefulness and quality that make up IT services, life cycle of IT services. IT service management processes. Organizational issues of IT services management.
11	Learning outcomes	Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.

1	Name of course	Business Economics
2	Code of course	EB 4304
3	Cycle of course	PD
4	Amount of credits	5

5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Fundamentals of Economics and Law, Business Statistics
9	Postrequisites	ICT Markets and Sales Organization, E-Business, IT Project Management
10	Course summary	Entrepreneurship: concept, essence, types and forms. The resource potential of the organization. Rationing and remuneration. Costs, financial performance. Economic efficiency of the organization and business projects. Marketing and organization management. State support for entrepreneurship. Business planning. Organization of business transactions. Responsibility of subjects. Risks in entrepreneurial activity. Entrepreneurial secret and ways to protect it. Termination of Entrepreneurship.
11	Learning outcomes	Classify the laws of economic development and law. Analyze the state and trends of the socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future. Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.

1	Name of course	Information Security
2	Code of course	IB 4305
3	Cycle of course	PD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Information and communication technologies, Information processes, systems and networks, Corporate information systems

9	Postrequisites	Project work
10	Course summary	Sources of threats. Technical, software, organizational, legal, cryptographic methods and means of information protection. Models and principles of protection against unauthorized access. Methods of antivirus protection of information. Legislative and regulatory framework in the field of information security of the Republic of Kazakhstan: "On personal data and their protection", Unified requirements in the field of ICT and information security, The concept of cybersecurity.
11	Learning outcomes	Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.

1	Name of course	Project IT management
2	Code of course	UIP 4306
3	Cycle of course	PD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Programming Technology, Systems Analysis and Decision Making, IT Service and Content Management.
9	Postrequisites	Project Work
10	Course summary	Project Management Knowledge Areas. Stages of IT project management. Areas of IT project management. Assets of an IT project. IT project management concepts. Project Management Standards. Design methodologies. Software development methodologies. Process groups for an IT project. Methodology for planning IT projects. Time management of an IT project. Project cost management. Project quality management. Human Resource Management Project. Project communications management. Project risk management.

11	Learning outcomes	<p>Classify the laws of economic development and law. Analyze the state and trends of the socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future. Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs. Determine the purpose and main components of database systems, the basic concepts of the relational data model. Build a conceptual model of a given subject area; apply database design techniques to solve practical problems in the field of corporate information systems. List the principles of data analysis and processing, methods of their presentation and storage; main problems and methods of data mining; capabilities of modern software development tools, hardware. Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.</p>
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1	Name of course	Basics of the Digital Economy
2	Code of course	OCE 4310
3	Cycle of course	PD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Business Process Modeling, E-Business, IT Marketing
9	Postrequisites	Graduate design
10	Course summary	<p>The concept of digital technology and the digital economy. Background and consequences of direct and indirect digitalization of public relations. Digital risks and security. State policy in the field of the digital economy. Industrial Internet. Components of robotics and sensorics. Areas of application of end-to-end technologies (cryptocurrencies, “smart city”). Platform technologies in the development of the digital economy. Examples of digital platforms. Industry transformation.</p>
11	Learning outcomes	<p>Classify the laws of economic development and law. Analyze the state and trends of the socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future. Design the objects of professional activity and their elements in accordance with the terms of reference and regulatory and technical documentation, observing various requirements, as well as conducting a feasibility study of design decisions and presentation of the work results.</p>

1	Name of course	Project work
2	Code of course	PR 4308
3	Cycle of course	PD
4	Amount of credits	8
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Software Systems Design, Information Security, IT Project Management
9	Postrequisites	Graduate design
10	Course summary	Basics of design work. Classification of basic concepts. The purpose and strategy of the project. Result and managed project parameters. The specifics of the organization / enterprise and its consideration in the design. Familiarity with project software. Project requirements. Stage design of real design. Source materials for design. The composition of the working draft. Typical projects. The procedure for approval and approval of projects.
11	Learning outcomes	Apply the basic methods of the natural sciences in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analyzing and systematizing information. Classify the laws of economic development and law. Analyze the state and trends of the socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future. Apply basic information processing algorithms to solve applied problems, evaluate the complexity of algorithms, programming and testing applications. Use communication protocols in the network; opportunities to build web sites. Develop user interfaces and applications. Use tools to develop mobile, cloud and web applications. Solve problems arising at different phases of the life cycle of software systems. Apply basic techniques and software testing programs. Determine the purpose and main components of database systems, the basic concepts of the relational data model. Build a conceptual model of a given subject area; apply database design techniques to solve practical problems in the field of corporate information systems. List the principles of data analysis and processing, methods of their presentation and storage; main problems and methods of data mining; capabilities of modern software development tools, hardware.



1	Name of course	Data Management
2	Code of course	UD 2206
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Information and communication technology
9	Postrequisites	Software Systems Design, Data Analysis, Corporate Information Systems
10	Course summary	Basic concepts of database theory. Database system architecture. Data transfer control system. Distributed processing. Relational Databases Data Integrity Conditions. The main properties of relationships. Indices. Database Design. Normalization of data. Database management system.
11	Learning outcomes	Determine the purpose and main components of database systems, the basic concepts of the relational data model. Build a conceptual model of a given subject area; apply database design techniques to solve practical problems in the field of corporate information systems.

1	Name of course	System Analysis and Decision Making
2	Code of course	SAPR 3209
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Mathematical Foundations of Information Technology, Information and Communication Technologies
9	Postrequisites	Data Analysis, Project work
10	Course summary	Methodology of system analysis and decision making. Typical classes of operation control tasks. Mathematical methods of system analysis and decision making. Application of methods and methodologies of system analysis and decision making in the development of computer systems.
11	Learning outcomes	List the principles of data analysis and processing, methods of their presentation and storage; main problems and methods of data mining; capabilities of modern software development tools, hardware.

1	Name of course	Corporate Information Systems
2	Code of course	KIS 3224
3	Cycle of course	BD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Programming Technology, Internet Application Development, Data Management
9	Postrequisites	Project work
10	Course summary	Introduction to corporate information systems (CIS). Corporate governance concept, methodology and standards. Corporate Information Systems. Modeling, designing and programming of corporate information systems (CIS). Enterprise Management Software.
11	Learning outcomes	Determine the purpose and main components of database systems, the basic concepts of the relational data model. Build a conceptual model of a given subject area; apply database design techniques to solve practical problems in the field of corporate information systems.

1	Name of course	Modeling of business processes
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2	Code of course	MBP 3226
3	Cycle of course	BD
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Programming Technology, Data Analysis, Data Management
9	Postrequisites	Project work, Graduation project
10	Course summary	Process modeling. System modeling, organizational structure model, data structure. Fundamentals of functional modeling. IDEF models, principles of construction and limitations. Models of the main and auxiliary processes. The relationship of models with each other. Maps of organization processes. Audit processes in the organization. Stages of developing a process audit program, planning audits, formulating goals and objectives, designing an audit report.
11	Learning outcomes	Classify the laws of economic development and law. Analyze the state and trends of the socio-economic development of the national and world economy. Analyze and interpret financial and accounting information; analyze socially significant problems and processes occurring in society, and predict their possible development in the future. List the principles of data analysis and processing, methods of their presentation and storage; main problems and methods of data mining; capabilities of modern software development tools, hardware.

1	Name of course	Data analysis in Microsoft Power BI
2	Code of course	AD
3	Cycle of course	BD
4	Amount of credits	5

5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	2
8	Prerequisites	Business Statistics, Mathematical foundation of information technologies
9	Postrequisites	Programming Technology, Python Programming, Java Programming, C/C++/C# Programming, Internet Applications Development, Software Systems Design
10	Course summary	Business Intelligence and Power BI. Power Query. Importing, processing, and merging data. Data modeling and an introduction to DAX. Data visualization. Working with DAX. Advanced DAX. Building complex reports. Power BI Service and Power BI Mobile. Implementation of Power BI.
11	Learning outcomes	Apply the basic methods of the natural sciences in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analyzing and systematizing information. List the principles of data analysis and processing, methods of their presentation and storage; main problems and methods of data mining; capabilities of modern software development tools, hardware.

1	Name of course	Data analysis
2	Code of course	AD 3301
3	Cycle of course	PD
4	Amount of credits	6
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	3
8	Prerequisites	Mathematical Foundations of Information Technologies, Information and Communication Technologies, System Analysis and Decision Making
9	Postrequisites	Business Process Modeling, Project work

10	Course summary	Concepts, techniques, mathematical methods and models intended for organizing the selection of the units to be examined from the studied set, their standard recording, systematization and processing in order to conveniently present and interpret them, and to obtain scientific and practical conclusions. General and sample population. Correlation analysis. Regression analysis. Classification of multidimensional spaces. Time Data Analysis.
11	Learning outcomes	Apply the basic methods of the natural sciences in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analyzing and systematizing information. List the principles of data analysis and processing, methods of their presentation and storage; main problems and methods of data mining; capabilities of modern software development tools, hardware.

1	Name of course	Basics of Neural Networks
2	Code of course	ONS 4303
3	Cycle of course	PD
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Information and Communication Technology
7	Year	4
8	Prerequisites	Mathematical foundations of information technology, Discrete mathematics applications and numerical methods, programming technology
9	Postrequisites	Project Work
10	Course summary	Basic concepts of the theory of neural networks. Models of neurons. Classification of neural networks. Teaching methods for an individual neuron. Algorithms and analytical methods for training neural networks. Programming neural networks. Genetic Algorithms. Computational capabilities of an individual neuron, direct distribution networks, recurrent neural networks. Analysis of neural network training logs. Selection of the optimal architecture of neural networks.

11	Learning outcomes	Apply the basic methods of the natural sciences in professional activities for theoretical and experimental research; use the appropriate mathematical apparatus and tools for processing, analyzing and systematizing information. List the principles of data analysis and processing, methods of their presentation and storage; main problems and methods of data mining; capabilities of modern software development tools, hardware.
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