Institute of Automation and Information Technology
Department of Cybersecurity, Information Processing and Storage

EDUCATIONAL PROGRAM
7M06103- «Management information systems»
(scientific and pedagogical direction, 2 years)
шифр и наименование образовательной программы

Code and classification of the field of education: 7M06 «Information and communication technologies»
Code and classification of training directions: 7M061 «Information and communication technologies»
Group of educational programs: M094 « Information technologies»
Level based on NQF: 7
Level based on IQF: 7
Study period: 2 years
Amount of credits: 120

Алматы 2025

Educational program 7M06103 «Management of information systems» was approved at the meeting of K.I.Satbayev KazNRTU Academic Council
Minutes №10 dated «_06__» ___03___ 2025.

Was reviewed and recommended for approval at the meeting of K.I.Satbayev KazNRTU Educational and Methodological Council
Minutes №3 dated «_20__» __12____2024.

Educational program 7M06103 «Management of information systems» was developed by Academic committee based on direction 7M061 «Information and communication technologies».

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Оглавление

List of abbreviations and designations

EP Educational program
BC – basic competencies
PC – professional competencies
LO – learning outcomes
MOOC – massive open online courses
NQF – National Qualifications Framework
IQF – Industry Qualifications Framework

1. Description of educational program

The educational programs of the Master's degree are structured according to the principle of modular training. The structure of the Master's degree program is formed from various types of educational and scientific work that determine the content of education. The Master's degree program contains:

1) theoretical training, including the study of cycles of basic and core disciplines;

2) practical training of undergraduates: various types of practices (pedagogical and research), professional internships;

3) research work of master's student (RWMS), including the implementation of a master's thesis – for scientific and pedagogical magistracy;

4) intermediate and final attestations (FA).

2. Purpose and objectives of educational program

Purpose of EP: Training of highly qualified specialists in the field of information management using modern information and communication technologies for all spheres of the national economy of Kazakhstan, capable of solving the tasks of effective management of both elements, processes and resources of the information system itself, as well as other elements, processes and resources of enterprises and organizations for sustainable development.

The global goal of the Management information Systems educational program is to contribute to the achievement of the Sustainable Development Goals (SDGs):

- Goal 4: Quality education (Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all);
- Goal 9: Industrialization, Innovation and Infrastructure (Building resilient infrastructure, promoting inclusive and sustainable industrialization and innovation);

Goal 17: Partnership for sustainable development

Tasks of EP:

1. Setting goals and objectives of the designed information systems based on the analysis of the information needs of the organization. (SDG 9)
2. The choice of modern technology for the design and development of IT solutions. (SDG 9)
3. Apply effective principles of IT resource management. (SDG 12)
4. Use mathematical methods to model the business processes of the organization, and develop algorithms for their implementation in information systems.
5. Develop IP applications and algorithms for the functioning of IP modules based on domain analysis in accordance with the goals of the SDGs (SDG 9);.
6. To carry out scientific and pedagogical activities, to participate in the development of educational and methodological materials for teaching in colleges and universities of disciplines in the direction of "Information and communication technologies". (SDG 4)

3. Requirements for evaluating the educational program learning outcomes

The educational program was developed in accordance with the State mandatory Standards of higher and Postgraduate Education, approved by the Order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No. 2 (registered in the Register of State Registration of

Regulatory Legal Acts under No. 28916) and reflects the learning outcomes on the basis of which curricula are developed (working curricula, individual curricula of students) and working curricula in disciplines (syllabuses). Mastering disciplines of at least 10% of the total volume of credits of the educational program using MOOC on the official platform

https://polytechonline.kz/cabinet/login/index.php /, as well as through the study of disciplines through the international educational platform Coursera https://www.coursera.org /.

Evaluation of learning outcomes is carried out according to the developed test tasks within the educational program in accordance with the requirements of the state mandatory standard of higher and postgraduate education.

When evaluating learning outcomes, uniform conditions and equal opportunities are created for students to demonstrate their knowledge, skills and abilities.

When conducting an interim certification in an online form, online proctoring is used.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	7M06 «Information and communication technologies»
2	Code and classification of training directions	7M061 «Information and communication technologies»
3	Educational program group	M094 « Information technologies»
4	Educational program name	7M06103 - "Management of Information Systems"
5	Short description of educational program	The program describes and regulates the procedure for training highly qualified specialists in the field of information management using modern information and communication technologies for all spheres of the national economy of Kazakhstan, capable of solving the tasks of effective management of both elements, processes and resources of the information system itself and other elements, processes and resources of the enterprise. The main functions of the professional activity of masters in the direction of "Information and communication technologies" are: design, development, analysis, testing, implementation of information systems for various purposes and their components, information management with the use of modern technologies
6	Purpose of EP	Training of highly qualified specialists in the field of information management using modern information and communication technologies for all spheres of the national economy of Kazakhstan, capable of solving the tasks of effective management of both elements, processes and resources of the information system itself, as well as other elements, processes and resources of enterprises and organizations for sustainable development.
7	Type of EP	New EP
8	The level based on NQF	7
9	The level based on IQF	7
10	Distinctive features of EP	No
11	List of competencies of educational program	Requirements for the key competencies of graduates of the scientific and pedagogical Master's degree should: 1) have an idea: - on the role of science and education in public life; - about current trends in the development of scientific knowledge;

		- about actual methodological and philosophical problems of natural (social, humanitarian, economic) sciences; - about the professional competence of a high school teacher; - about contradictions and socio-economic consequences of globalization processes. 2) know: - methodology of scientific cognition; - principles and structure of the organization of scientific activity; - psychology of cognitive activity of undergraduates in the learning process; - psychological methods and means of improving the effectiveness and quality of training. 3) be able to: - use the acquired knowledge for the original development and application of ideas in the context of scientific research; - critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena; - integrate knowledge gained in different disciplines to solve research problems in new unfamiliar conditions; - by integrating knowledge to make judgments and make decisions based on incomplete or limited information; - apply the knowledge of pedagogy and psychology of higher education in their teaching activities; - apply interactive teaching methods; - to carry out information-analytical and informationbibliographic work with the involvement of modern information technologies; - think creatively and creatively approach the solution of new problems and situations; - be fluent in a foreign language at a professional level that allows conducting scientific research and teaching special disciplines in universities; - summarize the results of research and analytical work in the form of a dissertation, scientific article, report, analytical note, etc. 4) have the skills of: - research activities, solving standard scientific problems; - implementation of educational and pedagogical activities on credit technology of training; - methods of teaching professional disciplines; - the use of modern information technologies in the educational process; - professional communication and intercultural communication; - oratory, correct and logical formalization of their thoughts in oral and written form; - expansion and deepening of knowledge necessary for daily professional activity and continuing education in

		doctoral studies. 5) be competent: - in the field of research methodology; - in the field of scientific and scientific-pedagogical activity in higher educational institutions; - in matters of modern educational technologies; - in the implementation of scientific projects and research in the professional field; - in ways to ensure constant updating of knowledge, expansion of professional skills and abilities
12	Learning outcomes of educational program	ON1. To have an idea of the current methodological and philosophical problems of the natural sciences and the professional competence of a higher school teacher. ON2. Know the methodology of scientific knowledge and the principles and structure of the organization of scientific activity. ON3. Be able to critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena. Be fluent in a foreign language at a professional level that allows for scientific research. ON4. Have an understanding of current methodological and philosophical issues of the natural sciences and the professional competence of a higher school teacher to ensure an inclusive and equitable quality education ON5. Apply methodology, models, methods, tools for the development and design of information systems to solve professional problems in order to promote innovation ON6. Apply project management in IT. ON7. Be able to critically analyze existing concepts, theories, and approaches to analyzing processes and phenomena. Be fluent in a foreign language at a professional level that allows you to conduct scientific research for partnership in the interests of sustainable development ON8. Perform knowledge processing in expert systems, apply artificial intelligence methods. Design intelligent systems. ON9. Design an information model of the subject area, use multi-user database administration methods, use modern DBMS to process databases. ON10. Apply the basic principles of big data technology in enterprise architecture and the basic methods of analytical processing of big data. ON11. Analyze the benefits of cloud technologies in NON-PROFIT JOINT STOCK COMPANY «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATBAYEV» 9 F KazNRTU 703-05 Educational program modern business to solve professional problems, apply the tools of this technology.
13	Education form	Full-time, online
14	Period of training	2 years

15	Amount of credits	120
16	Languages of instruction	Kazakh, Russian
17	Academic degree awarded	Master of Technical Sciences
18	Developer(s) and authors	Shukaev D.N. Satybaldieva R.J. Zhumagaliev B.I. Baymataeva S.M.

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)										
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
The cycle of basic disciplines The university component														
1	Foreign language (professional)	The course is designed for undergraduates of technical specialties to improve and develop foreign language communication skills in the professional and academic fields. The course introduces students to the general principles of professional and academic intercultural oral and written communication using modern pedagogical technologies (round tables, debates, discussions, analysis of professionally oriented cases, design).	3							v				
2	History and philosophy of science	The subject of philosophy of science, dynamics of science, specifics of science, science and pre-science, antiquity and the formation of theoretical science, the main stages of the historical development of science, features of classical science, nonclassical and post-nonclassical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of scientists and engineers..	3				v		v			v		

3	Higher school pedagogy	During the course, undergraduates will master the methodological and theoretical foundations of higher school pedagogy, learn how to use modern pedagogical technologies, plan and organize learning and upbringing processes, and master the communicative technologies of subject-subject interaction between a teacher and a graduate student in the educational process of a university. Undergraduates also study human resource management in educational organizations (using the example of higher education).	3				**v**						**v**	
4	Psychology of management	The discipline studies the modern role and content of psychological aspects in management activities. The article considers the improvement of psychological literacy of the student in the process of professional activity. He improves himself in the field of psychology and studies the composition and structure of management activities, both at the local and foreign levels. The psychological feature of modern managers is considered.	3				**v**						**v**	
The cycle of basic disciplines Optional component															
5	Analysis and modeling and design of information systems	The course is aimed at studying the principles and methods of modeling random parameters and processes of complex systems, and analyzing their functioning. In the process of studying the discipline, undergraduates will get	5	**v**				**v**						

		acquainted with modern methods of analyzing information systems and processes, an apparatus for simulating random and non-stationary parameters of complex systems, and learn how to use intelligent simulation tools and computer modeling technology. The issues of organizing computational experiments and using object-oriented analysis and modeling of information processes are also considered.												
6	Security of virtualization and cloud technology systems	During the course, the issues of cloud technology security and sources of threats in cloud computing will be considered. Cloud deployment models will be studied: public, private, hybrid clouds; cloud technology models; features and characteristics of cloud computing; information security standards in the field of cloud technologies and virtualization systems; cloud computing security tools; encryption; VPN networks; authentication; user isolation.	5								v		v	v
7	Intellectual property and scientific research	Purpose: to train specialists who are able to effectively manage intellectual property rights in the field of science, as well as ensure their legal protection and commercialization. Content: analysis of the legal protection of research and development results, methods of commercialization of scientific inventions, ethical and legal aspects of	5	v	v									

		scientific activity in the context of HISTORY.												
8	Artificial intelligence methods	The course is a comprehensive study of a class of machine learning algorithms such as convolutional, recurrent, and recursive neural networks. The discipline examines the methods of artificial intelligence, the principles of organization and use of intelligent information technologies.	5								v		v	
9	Computer modeling methods	The course is aimed at developing undergraduates' theoretical knowledge and practical skills for analyzing data obtained from the Internet and interpreting the results obtained. The course examines the basic data analysis methods used to work with Internet data, including all stages: initial, preprocessing, modeling, and model analysis. Working in the R environment with packages for analyzing Internet data. The use of methods for applying data mining algorithms in the search for patterns of user behavior	5							v				
10.	Database development in Microsoft SQL Server environment	The content of the discipline includes client/server database technologies, methods for creating multi-user databases and its objects, query optimization, technologies for storing and analyzing corporate data, models of analytical data processing in a DBMS.	5	v				v				v		
11	Sustainable development strategies	Objective: to develop deep knowledge and competencies in the development and implementation of sustainable	5		v									

		development strategies at various levels. Content: Covers a wide range of topics ranging from global environmental challenges such as climate change, loss of biodiversity and depletion of natural resources, to socio-economic aspects including inequality, health and education.												
12	Web Mining	The course is aimed at developing undergraduates' theoretical knowledge and practical skills for analyzing data obtained from the Internet and interpreting the results obtained. The course examines the basic data analysis methods used to work with Internet data, including all stages: initial, preprocessing, modeling, and model analysis. Working in the R environment with packages for analyzing Internet data. The use of methods for applying data mining algorithms in the search for patterns of user behavior	5			v						v		
The cycle of core disciplines University component														
13	Architecture of information systems	The purpose of the course is to master and systematize theoretical knowledge in the field of architectures of modern information systems (IS). The content of the discipline includes the classification of IP architecture, principles of IP construction, models and resources of information systems, the main components of information systems. During the course, students will use	5	v				v					v	v

		information system architecture development tools and information system development tools.												
14	Methodology of scientific research and innovative activity	The purpose of the course is to develop the student's skills in conducting research activities. The content of the discipline includes questions of determining the direction of research; goals and objectives of research; stages of writing a scientific publication, literary review; organization of a scientific experiment; areas of innovation; the role of scientific research in innovation.	5		v	v	v	v			v			
15	Image recognition and object identification	The course is aimed at studying methods and algorithms of data analysis in order to identify and classify objects or images. The course content includes the use of various techniques and applications of signal processing, computer vision, machine learning, and neural networks for automatic recognition and identification of images, sounds, texts, and other forms of information. Implementation of pattern recognition algorithms using various software tools and libraries, analysis of results.	4			v						v		
16	IT management	The purpose of the course is to study the concepts, goals and objectives of information management. The issues covered in the course are: enterprise architecture and its management; concepts, methodologies and standards	5				v	v	v					

		of corporate governance; methodologies and standards of information technology management; trends and prospects of information management development. As a result of mastering the discipline, undergraduates will be able to apply management methodology in IT projects.												
The cycle of profile disciplines Component of choice														
17	Geographic information systems	The purpose of studying the discipline is to familiarize undergraduates with existing Geographic Information Systems (GIS), to teach the typical structure of modern Geographic information systems and its functionality. The course content includes the following: principles and functions of GIS; components of GIS; data structure in GIS; design of information systems using GIS technology	5							**v**		**v**		**v**
18	Intelligent data processing methods	The course aims to provide undergraduates with a set of theoretical knowledge and methodological foundations in the field of data mining and data processing methods, as well as practical skills necessary for the implementation and practical use of intelligent algorithms for data analysis and processing. In the process of mastering the discipline, the student learns to independently carry out	5							**v**		**v**		**v**

		experimental research to solve research and production tasks.												
19	Methods and means of building information search systems	The discipline studies the methods and principles of building information retrieval systems (IPS) and their practical application. The presentation of information in IPS, the principles of text analysis and document indexing, typical models (Boolean and vector) and algorithms for information retrieval are considered. Basic information about the classification of documents is provided. The course examines modern vocabulary, classification, and meta-search IPS, their practical application, and performance criteria.	5	v			v			v				v
20	Business process modeling methods	The course is aimed at developing students' skills in modeling and analyzing business processes in order to solve applied problems. The content of the discipline includes questions about the system, process-oriented approach to business management, methodologies and models, tools for modeling and analyzing business processes and managing complex systems. In the course of studying the discipline, undergraduates use modern modeling and analysis tools.	5	v	v			v						
21	Models and methods of decision-making in IP	The purpose of teaching the discipline is to study models and methods used in decision support systems, as well as in the development of modern computer information systems. The content of the	5	v				v						v

		discipline includes mathematical methods of operation research, methods for solving nonlinear problems of unconditional optimization, methods for solving nonlinear problems of conditional optimization, application of methods and methodology of operation management in the development of computer information processing and control systems.												
22	Applied statistics and data analysis	Applied statistics is a methodological discipline that is the center of statistics. When applying the methods of applied statistics to specific fields of knowledge and branches of the national economy, scientific and practical disciplines such as "statistics in industry", "statistics in medicine", "statistics in psychology", etc. are obtained. From this point of view, econometrics is "statistical methods in economics." Mathematical statistics plays the role of a mathematical foundation for applied statistics.	5			v		v			v			
23	Theory and practice of data analysis and interpretation	The purpose of the course is to explore the possibilities of algorithmic support for systems designed for data analysis and interpretation. The discipline considers methods of data analysis and further interpretation of the results obtained. Considerable attention is paid to the issues of data classification using deterministic and statistical models. Methods of reducing data dimensions	5			v		v				v		

		are considered. New methods of data analysis based on Data Mining technology are being studied. Modern application software packages for solving experimental data processing problems are analyzed.												
24	Big Data and data analysis	The purpose of the course is to develop students' professional competence in the development and use of systems for processing and analyzing large amounts of data. The content of the discipline examines the methods of analyzing and storing large amounts of data, the stages of the life cycle of big data processing, the languages most suitable for processing and analyzing big data, and ways to organize storage and access to big data.	5								v	v		
25	Business Intelligence	The course is aimed at studying methods and algorithms of data analysis in order to identify and classify objects or images. The course content includes the use of various techniques and applications of signal processing, computer vision, machine learning, and neural networks for automatic recognition and identification of images, sounds, texts, and other forms of information. Implementation of pattern recognition algorithms using various software tools and libraries, analysis of results.	5								v		v	v
26	Cloud computing	The course will allow you to gain the competencies necessary to work with	5								v	v		

		cloud systems with different settings. The course content addresses the following issues: data collection, visualization, storage, security and automation; designing and deploying a cloud storage system; developing the most convenient and effective strategy for migrating legacy systems to the cloud; developing testing methods to evaluate the effectiveness of corporate cloud systems in order to make recommendations for their improvement.												
27	Data mining,	Data minig is an interdisciplinary discipline that studies the analysis and processing of data of various structures and volumes. Data mining methods are important in the research and development of information systems that solve problems of data analysis, forecasting various indicators in various fields of human activity. In this discipline, students learn both visual and analytical methods to determine the structure of data. The methods of descriptive, cluster, variance, regression data analysis and other parametric and nonparametric methods are studied. During the research, the students use both software packages and special programming languages.	5			**v**						**v**		
28	Machine Learning & Deep Learning	The course focuses on deep learning models. As an area within machine learning, deep learning models illustrate	5			**v**						**v**		

		the quantitative-qualitative transition. New models and their properties require separate study and practice of adjusting the meta-parameters of such models. This course covers the basics of deep learning, Neural networks, convolutional networks, RN, LSTM, Adam, Dropout, BatchNorm, and Xavier/He initialization.												