



**Institute of** automation and information technologies  
**Department of** cybersecurity, information processing and storage

**EDUCATIONAL PROGRAM**  
**7M06108 «Management of information systems»**

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: **1,5 years**


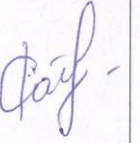
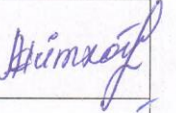
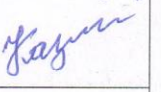
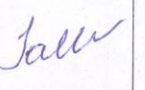
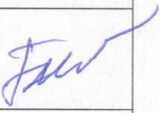



Amount of credits: **90**

**Almaty 2023**

Educational program 7M06108 «Management of information systems» was approved at the meeting of K.I.Satbayev KazNRTU Academic Council Minutes # 3 dated «27» October 2022.

Was reviewed and recommended for approval at the meeting of K.I.Satbayev KazNRTU Educational and Methodological Council Minutes # 2 dated «21» October 2022.

Educational program 7M06108 «Management of information systems» was developed by Academic committee based on direction 7M061 «Information and communication technologies».

Full name	Academic degree/ academic title	Position	Workplace	Signature
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<b>Employers:</b>				
Amiret T. Konuspaev	Candidate of Physical and Mathematical Sciences	President	Association of Innovative Companies of the Special Economic Zone "Park of Innovative Technologies"	
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### **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  
IT – Information technologies

## **1. Description of educational program**

The Master's degree program is 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, professional internships;
- 3) research work, including the implementation of a master's thesis,
- 4) intermediate and final attestations.

## **2. Purpose and objectives of educational program**

**Purpose of EP:** Training highly qualified specialists who can solve of tasks for receiving, storing, processing, analyzing, presenting and transmitting information using modern information and communication technologies.

### **Tasks of EP:**

1. Setting goals and objectives of the designed information systems based on the analysis of the information needs of the organization.
2. Selection of modern technologies for designing and developing IT solutions.
3. Application of effective principles and methods of IT resource management.
4. The use of mathematical methods for modeling business processes of the organization, the development of algorithms for their implementation in information systems for various purposes.
5. Develop IP applications and algorithms for the functioning of IP modules based on domain analysis.
6. Training of technical staff on the development and maintenance of information systems and their subsystems.

## **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**

<b>№</b>	<b>Field name</b>	<b>Comments</b>
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	7M06108 «Management of information systems»
5	Short description of educational program	<p>The Master's degree program in the profile direction implements educational programs of postgraduate education for the training of managerial personnel with in-depth professional training.</p> <p>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.</p> <p>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 support using modern technologies.</p>
6	Purpose of EP	Training highly qualified specialists who can solve of tasks for receiving, storing, processing, analyzing, presenting and transmitting information using modern information and communication technologies.
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	A graduate who has mastered master's degree programs

	educational program	<p>must have the following general professional competencies:</p> <ul style="list-style-type: none"> <li>- the ability to apply in practice the knowledge of fundamental and applied sections of disciplines that determine the orientation (profile) of the master's degree program;</li> <li>– the ability to formulate research goals independently, establish the sequence of solving professional tasks;</li> <li>– the ability to professionally select and creatively use modern scientific and technical equipment to solve applied problems;</li> <li>– the ability to critically analyze, present, defend, discuss and disseminate the results of their professional activities;</li> <li>– proficiency in the preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles;</li> <li>– willingness to lead a team in the field of their professional activities, tolerantly perceiving social, ethnic, confessional and cultural differences;</li> <li>– readiness to communicate orally and in writing in a foreign language to solve the tasks of professional activity;</li> </ul> <p>A graduate who has mastered the master's degree program must have professional competencies corresponding to the types of professional activities that the master's degree program is focused on:</p> <p>scientific and production activities:</p> <ul style="list-style-type: none"> <li>- the ability to independently carry out production and scientific–production, laboratory and interpretative work in solving practical problems;</li> <li>– the ability to professionally operate modern laboratory equipment and devices in the field of the master's degree program;</li> <li>– the ability to use modern methods of processing and interpreting complex information to solve production problems;</li> </ul> <p>project activity:</p> <ul style="list-style-type: none"> <li>– the ability to independently compile and submit projects of research and scientific-production works in the field of information security;</li> <li>– readiness to design complex research and scientific-production works in solving professional tasks;</li> </ul> <p>organizational and managerial activities:</p> <ul style="list-style-type: none"> <li>– readiness to use practical skills in organizing and managing research and scientific-production work in solving professional tasks;</li> <li>- readiness for the practical use of regulatory documents in the planning and organization of scientific and production work in the field of information security.</li> </ul>
12	Learning outcomes of educational program	ON1. Be fluent in a foreign language at a professional level that allows you to conduct scientific research. Be

		<p>able to critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena.</p> <p>ON2. Apply the methodology, models, methods, development and design tools for the development of information systems.</p> <p>ON3. Use project management methods in IT</p> <p>ON4. Organize (structure) knowledge in expert systems, apply artificial intelligence methods. Design intelligent systems.</p> <p>ON5. Design an information model of the subject area, use the methods of administration of multi-user databases.</p> <p>ON6. Apply the basic principles of using big data in enterprise architecture and the main methods of analytical processing and storage of big data.</p> <p>ON7. Build models of processes occurring in various systems. Analyze the processes in the organization and the benefits of cloud technologies in modern business to solve professional problems. Apply the tools of this technology.</p> <p>ON8. Obtain and process information from various sources. Apply information retrieval techniques, interpret data and visualize.</p>
13	Education form	Full-time, online
14	Period of training	1,5 years
15	Amount of credits	90
16	Languages of instruction	Kazakh, Russian
17	Academic degree awarded	Master of Engineering and Technology
18	Developer(s) and authors	R.Satybaldieva, E.Aitkhozhaeva



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

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)							
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Cycle of basic disciplines											
University component											
1	Foreign language (professional)	The course is designed for undergraduates of technical specialties to improve and develop foreign language communication skills in 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. The course ends with a final exam. Undergraduates also need to study independently (MIS).	2	v							
2	Management	The purpose of the discipline is the formation of a scientific understanding of management as a form of professional activity; mastering the general theoretical provisions of the management of socio-economic systems by students; mastering the skills and abilities of practical solution of managerial problems; studying the world experience of management, as well as the peculiarities of Kazakhstani management, training in solving practical issues related to the management of various aspects of the activities of organizations.	2			v			v		
3	Psychology of management (MOOC)	The course is aimed at mastering the tools for effective employee management, based on knowledge of the psychological mechanisms of the manager's activity. Discipline will help you master the skills of making decisions, creating a favorable psychological climate, motivating employees, setting goals, building a team and communicating with employees. At the end of the course, undergraduates will learn how to resolve managerial conflicts, create their own	2		v	v					

		image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.									
<b>Cycle of basic disciplines Component of choice</b>											
4	Analysis and modeling of information systems	In the course of a discipline study undergraduates shall: to know the modern methods of the analysis of information systems and processes, the device of simulation of accidental and nonstationary parameters of difficult systems; to be able to apply intellectual means of simulation, technology of computer simulation; to have skills of the organization of computing experiments and use of the object-oriented device of the analysis and simulation of information processes.	4		v			v			
5	Methods and Applications of Computer Simulation	Methods for modeling parameters and processes with given or predicted patterns of their values. Study of typical schemes for modeling processes occurring in various systems. Application of computer modeling methods in production, logistics, organizational, economic and financial systems, taking into account instabilities and conflict situations.	4				v				
6	Artificial intelligence methods	The course is a comprehensive study of a class of machine learning algorithms, such as convolutional, recurrent, and recursive neural networks. Within the framework of the discipline, the methods of artificial intelligence, the principles of organization and use of intelligent information technologies are considered.	5				v		v		
7	Web Mining	The course is aimed at developing theoretical knowledge and practical skills for undergraduates to analyze data received from the Internet and interpret the results. The course examines the main methods of data analysis used to work with Internet data, including all stages: initial, preprocessing, modeling, model analysis. Work in the R environment with packages for analyzing Internet data. Using Data Mining Algorithm Methods to Search for User Behavior Patterns	5						v		v
<b>Cycle of profile disciplines University component</b>											

8	The architecture of information systems (Coursera)	The aim of the course is to master and systematize theoretical knowledge in the field of modern information systems architectures. 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 information system architecture development tools and information system development tools.	5		v				v		
9	IT management	The purpose of mastering the course is to study the concept, goals and objectives of information management. Issues covered in the course: enterprise architecture and its management; concepts, methodologies and standards of corporate governance; methodologies and standards for information technology management; trends and prospects for the development of information management. As a result of mastering the discipline, undergraduates will be able to apply the management methodology in IT projects	5			v		v		v	
10	Production practice I	The production practice is aimed at strengthening knowledge and developing practical experience in the field of IP management. The objectives of the internship include the participation of undergraduates in the organization and management of research and production work in solving professional tasks; readiness for the practical use of regulatory documents in the planning and organization of work in the selection of modern technologies for the design and development of IT solutions. Application of effective principles and methods of IT resource management.	5		v		v				v
11	Production practice II	The production practice is aimed at strengthening knowledge and developing practical experience in the field of IP management. The practice is aimed at the ability to use modern methods of processing and interpreting complex information to solve production problems. The use of mathematical methods for modeling business processes of an organization, the development of algorithms for their implementation in	4		v		v				v

		information systems for various purposes. Develop information systems applications and algorithms for the functioning of IS modules based on domain analysis.									
<b>Cycle of profile disciplines</b> <b>Component of choice</b>											
12	Data analysis and Data retrieval	The discipline is aimed to teach information retrieval and data mining techniques. It is about how to find relevant information and subsequently extract meaningful patterns out of it. While the basic theories and mathematical models of information retrieval and data mining are covered, the discipline is primarily focused on practical algorithms of textual document indexing, relevance ranking, web usage mining, text analytics, as well as their performance evaluations. Practical retrieval and data mining applications such as web search engines, personalisation and recommender systems, business intelligence, and fraud detection will also be covered.	5				v		v		v
13	Methods and tools for building information retrieval 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 information retrieval algorithms are considered. Basic information about the classification of documents is given. The course examines modern vocabulary, classification and metasearch IPS, their practical application and performance criteria.	5					v			v
14	Methods of modeling business processes	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 a systematic, 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 tools for modeling and analyzing business processes.	5			v				v	

15	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 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 systems for information processing and management	5					v		v	
16	Applied statistics and data analysis	Applied statistics - methodological discipline, which is the center of statistics. When applying applied statistics methods to specific areas 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 economy ". Mathematical statistics plays the role of a mathematical foundation for applied statistics.	5						v		v
17	Theory and practice of statistics	The aim of the course is to study the possibilities of algorithmic support of systems designed for data analysis and interpretation. The discipline considers methods of data analysis and further interpretation of the results. Considerable attention is paid to the issues of data classification using deterministic and statistical models. Methods for reducing data dimensions are considered. New methods of data analysis based on Data Mining technology are being studied. Modern packages of applied programs for solving problems of processing experimental data are analyzed.	5						v		v
18	Big Data and Data Analysis	The purpose of the course is to form 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 analysis and storage of large amounts of data, the stages of the life cycle of big data	5						v		v

		processing, the languages best suited for processing and analytics of big data, ways of organizing storage and access to big data.									
19	Business Intelligence	The course is aimed at forming a set of theoretical knowledge and practical skills of applying modern information tools of business analytics for business management among undergraduates. During the practical lesson, undergraduates master the skills of working in the most popular business intelligence platforms: Power BI, Qlik Sense, Tableau for decision support in marketing and business management; OLAP (online analytical processing) skills in solving analytical tasks: exploratory analysis, data research, analytical reporting formation.	5				v				v
20	Cloud computing	The course will provide you with the competencies necessary to work with cloud systems with different settings. The course content considers the following issues: collection, visualization, data storage, their security and automation; design and deployment of a cloud storage system; developing the most convenient and effective strategy for migrating legacy systems to the cloud; development of testing methods for evaluating the effectiveness of corporate cloud systems in order to make recommendations for their improvement.	5							v	v
21	Data mining	Data mining 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 data analytics tasks, forecasting various indicators in various fields of human activity. In this discipline, students study both visual and analytical methods to determine the structure of data. Methods are studied: descriptive, cluster, variance, regression analysis of data and other parametric and nonparametric methods. In the study, students use both software packages and special programming languages.	5						v		v

22	Machine Learning & Deep Learning	The course focuses on deep learning models. As a field within machine learning, deep learning models exemplify the quantitative-qualitative transition. New models and their properties require a separate study and practice of setting the metaparameters of such models. This course covers deep learning fundamentals, neural networks, convolutional networks, RNN, LSTM, Adam, Dropout, BatchNorm, Xavier/He initializations.	5					v			v	
23	OLAP and Data Warehousing	The purpose of mastering the discipline is to obtain in-depth knowledge of data storage systems and data mining and data processing technologies. The content of the discipline includes questions on the types of data models, the concept and architecture of data warehouses, the implementation of procedures and examples of modern corporate systems using OLAP technology. Upon completion of the course, undergraduates will be able to design data warehouses and apply data processing technologies to solve research problems.	5							v	v	
Experimental research work of a master's student												
	Experimental research work of a master's student, including internship and master's project	Experimental research work is part of the educational process of a graduate student and is a comprehensive study in the chosen direction in the field of information systems management under the guidance of a supervisor from among experienced teaching staff or a representative of an external organization. The work is implemented by: - preparation of a publication based on the results of the experimental research work of a graduate student; - periodic public protection of EIRM results; - participation in the republican competition of research works of undergraduates; - internships in leading scientific centers and universities of the country, including abroad; - preparation of the final graduation paper (project).	18			v		v				v

## 5. Curriculum of educational program

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“KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY NAMED AFTER K.I.SATBAYEV”



**CURRICULUM**  
**of Educational Program on enrollment for 2023-2024 academic year**  
**Educational program 7M06108 "Management of Information System"**  
**Group of educational programs M094 "Information technologies"**

**Form of study:** full-time **Duration of training:** 1,5 years **Academic degree:** Master of Engineering and Technology

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lek/lab/pr	SIS (including TSIS) in hours	Form of control	Distribution of classroom classes by courses and semesters		
								I course		2 course
								1 semester	2 semester	3 semester
CYCLE OF BASIC DISCIPLINES (BD)										
M-1. Basic training module (university component and component of choice)										
LNG212	Foreign language (professional)	BD, UC	2	60	0/0/2	30	E	2		
MNG726	Management	BD, UC	2	60	1/0/1	30	E	2		
HUM211	Psychology of management	BD, UC	2	60	1/0/1	30	E	2		
CSE772	Analysis and modeling of information systems	BD, CCH	4	120	1/0/2	75	E	4		
CSE771	Methods and Applications of Computer Simulation				2/0/1					
SEC773	Artificial intelligence methods	BD, CCH	5	150	2/0/1	105	E	5		
CSE774	Web Mining				2/0/1					
CYCLE OF PROFILE DISCIPLINES (PD)										
M-2. Professional training module (university component and component of choice)										
CSE765	IT management	PD, UC	5	150	2/0/1	105	E	5		
CSE203	The architecture of information systems	PD, UC	5	150	1/1/1	105	E	5		
CSE211	Models and methods of decision-making in IP	PD, CCH	5	150	1/1/1	105	E	5		
CSE769	Methods and tools for building information retrieval systems				2/0/1					
CSE764	Cloud computing	PD, CCH	5	150	2/0/1	105	E		5	
SEC232	Business Intelligence				2/0/1					
M-3. Module of scientific research, data analysis and modeling (component of choice)										
CSE767	Data mining	PD, CCH	5	150	2/0/1	105	E		5	
CSE207	Methods of modeling business processes				2/0/1					
CSE219	Theory and practice of statistics	PD, CCH	5	150	1/1/1	105	E		5	
SEC230	Applied statistics and data analysis				1/0/2					
M-4. Data management and processing module in IS (component of choice)										
SEC246	Big Data and Data Analysis	PD, CCH	5	150	2/1/0	105	E		5	
CSE746	Machine Learning & Deep Learning				2/0/1					
CSE258	Data analysis and Data retrieval	PD, CCH	5	150	1/1/1	105	E		5	
SEC234	OLAP and Data Warehousing				1/1/1					
M-5. Practice-oriented module										
CSE782	Production practice I	PD, UC	5						5	
CSE783	Production practice II	PD, UC	4							4



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M-6. Experimental research module										
AAP249	Experimental research work of a master's student, including internship and implementation of a master's project	ERWM	18							18
M-7. Module of final attestation										
ECA213	Registration and protection of the master's project	RaPMP	8							8
<b>Total by UNIVERSITY:</b>								<b>30</b>	<b>30</b>	<b>30</b>
								<b>60</b>		<b>30</b>

Number of credits for the entire period of study				
Cycle code	Cycles of disciplines	Credits		
		university component (UC)	component of choice (CCH)	Total
BD	Cycle of basic disciplines	6	9	15
PD	Cycle of profile disciplines	19	30	49
	<b>Total for theoretical training:</b>	<b>25</b>	<b>39</b>	<b>64</b>
ERWM	Experimental research work of a master's student	18		18
RaPMP	Registration and protection of the master's project	8		8
	<b>Total:</b>	<b>51</b>	<b>39</b>	<b>90</b>

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 3 "27" october 2022 y.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev.  
Protocol № 2 "21" october 2022 y.

Decision of the Academic Council of the Institute Automation and Information Technologies  
Protocol № 2 "21" september 2022 y.

Governing Board member - Vice-Rector for Academic Affairs



B.A. Zhautikov

Institute Director Automation and Information Technology



R.K. Uskenbayeva

Department Head "Cybersecurity, information processing and storage"



R.Zh. Satybaldieva

Representative of the Council from employers



V.V. Pokusov