



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

EDUCATIONAL PROGRAM
7M06303 «Comprehensive information security»

Code and classification of the field of education: **7M06 «Information and communication technologies»**

Code and classification of training directions **7M063 «Information security»**

Group of educational programs: **M095 «IT security»**

Level based on NQF: **7**

Level based on IQF: **7**

Study period: **1 year**

Amount of credits: **60**

Almaty 2023

Educational program 7M06303 «Comprehensive information security» 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 7M06303 «Comprehensive information security» was developed by Academic committee based on direction 7M063 «Information security».

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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
IS – information security
ICT – Information and communication technologies
IT – information Technology

1. Description of educational program

The educational program 7M06303 “Comprehensive information security” is aimed at training master’s students in a specialized field. The program includes basic and specialized disciplines with the achievement of relevant competencies, as well as various types of internships (production practice, experimental research and internship).

The professional activities of masters are aimed at the field of information protection and security, namely the comprehensive provision of information security and engineering and technical protection of information.

Training of specialized masters in information security will be carried out according to the updated educational program 7M06303 “Comprehensive information security”. The programs of disciplines and modules of the educational program are interdisciplinary and multidisciplinary in nature, developed taking into account the relevant educational programs of the world's leading universities and the international classifier of professional activities in the field of information security.

The educational program ensures the application of an individual approach to students, the transformation of professional competencies from professional standards and qualification standards into learning outcomes and ways to achieve them.

The educational program was developed based on an analysis of the labor functions of an information security administrator, information security auditor, and information security engineer, as stated in professional standards.

The main criterion for completing studies in master's programs is the mastery of all types of educational and professional activities of the master's student.

Upon successful completion of the full course, the student is awarded a Master of Engineering and Technology degree in the educational program 7M06303 “Comprehensive information security.”

A graduate can perform the following types of work:

- design and engineering;
- production and technological;
- experimental research;
- organizational and managerial;
- operational.

Representatives of Kazakh companies and associations, specialists from departmental structures in the field of protection and security participated in the development of the educational program.

2. Purpose and objectives of educational program

Purpose of EP: Training highly qualified specialists who can solve problems planning information security audit work, identifying and fixing vulnerabilities, monitoring and investigating information security incidents.

Tasks of EP: Training of highly qualified specialists who can solve the following tasks:

- planning work on information security audit;
- organizational support for IS audit;
- carrying out an analysis of the compliance of design, operational and technical documentation on information security with the requirements in the field of ICT and information security support for the object of the information security audit;
- analysis of the current state of security of the IS audit object;
- identification and elimination of vulnerabilities;
- monitoring and investigating IS incidents;
- development of a model of threats to IS in enterprises;
- development of technical specifications for the creation of an IS system.

The Master of Engineering and Technology in the master's degree in educational program 7M06303 “Comprehensive information security” is focused on independently determining the goals of professional activity and choosing adequate methods and means to achieve them, carrying out innovative activities to obtain new knowledge. In addition, it is focused on the organization, design, development, management and audit of applied information protection and security systems for all sectors of the economy, government organizations and other areas of activity.

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	7M063 «Information security »
3	Educational program group	M094 «IT security»
4	Educational program name	7M06303 «Comprehensive information security»
5	Short description of educational program	<p>Professional activities of graduates include: education, government and departmental structures, economics and industry of the state, and healthcare.</p> <p>The objects of professional activity of graduates of master's programs in the educational program 7M06303 “Comprehensive information security” are:</p> <ul style="list-style-type: none"> – government bodies; – information security departments and departments of departmental organizations; – information security departments, IT departments and departments of financial organizations; – information security departments, IT departments and departments of industrial enterprises; – departments and departments of information security of government organizations and commercial structures. <p>The main functions of the professional activities of undergraduates are: conducting research in the field of information protection and security; audit, vulnerability analysis and incident investigation in information security systems; design, implementation, operation, administration, maintenance and testing of enterprise information security systems.</p> <p>Areas of professional activity are the following:</p> <ul style="list-style-type: none"> – design, development, implementation and operation of information security systems; – analysis, testing and identification of system vulnerabilities; – information security audit.
6	Purpose of EP	Training highly qualified specialists who can solve problems planning information security audit work, identifying and fixing vulnerabilities, monitoring and investigating information security incidents.
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	<p>Graduates of the profile master's degree, must:</p> <p>1) have an idea:</p> <ul style="list-style-type: none"> – contradictions and socio-economic consequences of globalization processes;

	<ul style="list-style-type: none"> – on professional competence in the field of information protection and security; – about the technology of virtualization of resources and platforms; – on the intellectualization of information security tools; – about database protection technologies; – about cryptographic information protection algorithms; – about big data analysis. <p>2) know:</p> <ul style="list-style-type: none"> – algorithms for cryptographic protection of information; – information security standards and IT security assessment criteria; – resource and platform virtualization technologies and virtualization systems from leading manufacturers; – threats and risks of virtualization systems, principles of building hypervisors and their vulnerabilities; – organization of IP networks, structure of IP packets and IP protocols; – internal organization of OS media; – methods and means of storing key information and encryption; – varieties and principles of authentication; – database protection technologies and methods of designing secure databases; – organization of the database protection and security system; – methods and tools of active audit. <p>3) be able to:</p> <ul style="list-style-type: none"> – to use the acquired knowledge for the original development and application of ideas in the context of experimental research; – critically analyze existing concepts 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; – to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies; – to think creatively and creatively approach the solution of new problems and situations; – be fluent in a foreign language at a professional level that allows you to conduct research; – summarize the results of research and analytical work in the form of a dissertation, an article, a report, an analytical note, etc.; – apply algorithms for cryptographic protection of information; – apply IS standards and conduct an IT security assessment; – apply virtualization systems from leading manufacturers; – identify threats and risks of virtualization systems; – apply methods and means of storing key information and
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		<p>encryption;</p> <ul style="list-style-type: none"> – apply database protection technologies and secure database design methods; – organize a database protection and security system; – apply methods and tools of active audit; – apply big data analysis tools. <p>4) have skills:</p> <ul style="list-style-type: none"> – use of modern information technologies; – professional communication and intercultural communication; – correct and logical formalization of their thoughts in oral and written form; – organization and protection of database security; – conducting an information security audit; – application of algorithms for cryptographic protection of information; – identifying threats and countering them; – working with Big Data; – expanding and deepening the knowledge necessary for daily professional activities and continuing education in doctoral studies. <p>5) be competent:</p> <ul style="list-style-type: none"> – in the implementation of projects and research in the professional field; – in the organization of information security systems; – in conducting an information security audit; – in ensuring the information security of the organization; - in ways to ensure constant updating of knowledge, expansion of professional skills and abilities.
12	Learning outcomes of educational program	<p>ON1. Independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities</p> <p>ON2. Apply in practice the knowledge of fundamental and applied sections of the disciplines that determine the direction (profile) of the master's program</p> <p>ON3. To lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, confessional and cultural differences. Ready to communicate in oral and written forms in a foreign language to solve the problems of professional activity</p> <p>ON4. Apply cryptographic information protection algorithms, information security standards. Ability to conduct an information security audit and implement information technology security assessment criteria.</p> <p>ON5. Apply resource and platform virtualization technologies, having knowledge of the principles of organizing the safe use of virtualization systems and cloud technologies.</p> <p>ON6. Apply database protection technologies and secure database design methods, organize a database protection and security system, and use big data analysis tools.</p> <p>ON7. Analyze threats and develop information security</p>

		systems in the organization using cryptographic protection algorithms ON8. Demonstrates mastery of tools for investigating computer incidents. Applies data leakage prevention systems. ON9. The ability to conduct independent research, including the skills and abilities of analysis, synthesis, evaluation, and obtaining original scientific results, contributing to the development in the field of information security
13	Education form	Full-time, online
14	Period of training	1 year
15	Amount of credits	60
16	Languages of instruction	Kazakh, Russian
17	Academic degree awarded	Master of Engineering and Technology
18	Developer(s) and authors	R.Satybaldieva, E.Aitkhozaeva

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	PO9
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		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	2	v		v						

		a team and communicating with employees. At the end of the course, undergraduates will learn how to resolve managerial conflicts, create their own image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.										
Cycle of basic disciplines Component of choice												
4	Algorithms for cryptographic protection of information	The modern cryptography and tasks connected to information security problems. The formal determination of the cryptosystem. Classical cryptosystems. Main objectives of crypto-analysis. Stream encryption. Cryptosystems with public key. Applications of mathematical simulation in cryptography. Merits and demerits of different systems. Euler and Fermat's theorems. Key management. System without transmission of a key. Problem of prime factorization. Problem of the discrete logarithm. Crypto-firmness problem. Systems of information security, diagram of the digital signature, authentication protocols and identifications.	4	v			v			v		
5	Cryptographic methods and means of information protection	Master's degree. Modern cryptography and tasks related to information security problems. Formal definition of a cryptosystem. classical cryptosystems. The main tasks of cryptanalysis. Stream encryption. Cryptosystems with a public key. Applications of mathematical modeling in cryptography. Advantages and disadvantages of various systems. Euler's and Fermat's theorems. Key management, Keyless system. The problem of decomposition into prime factors. Discrete logarithm problem. The problem of cryptographic strength. Information security systems, electronic signature schemes, authentication and	4				v			v		

		identification protocols.										
Cycle of profile disciplines University component												
6	Organization of information security systems	The concept of information security systems. Information security systems standards. Select an object to organize the system. Threat analysis and security software development. Administrative and procedural levels of information security. Analysis and selection of information security methods. Provision and evaluation of objects	5				v				v	v
7	Production practice	The production practice is aimed at strengthening knowledge and developing practical experience in the field of information security. The objectives of the practice include the participation of undergraduates in the organization of computer information protection, network technology, organization of computer systems and networks. The practice is aimed at the ability to independently carry out production, laboratory and interpretation work when solving practical problems.	9	v	v							v
Cycle of profile disciplines Component of choice												
8	Information Security Audit	Audit of information security. Basic terms, definitions, concepts and principles in the field of information security audit. The main directions of the audit of information security. Types and objectives of the audit. The main stages of the security audit. A list of the initial data required to conduct a security audit. Assessment of the current state of the information security system. Assessment of the level of safety. Risk analysis, assessment of the level of security, development of security policies and other organizational and administrative documents for the protection of information. Effective programs to build	5		v		v				v	v

		an organization's security system										
9	Security of virtualization systems and cloud technologies (Coursera)	Cloud computing, distributed data processing. Models of cloud deployment: public, private, hybrid clouds. Models of cloud technologies IaaS, PaaS, SaaS. The use of virtualization, virtualization technology, data centers, telecommunications networks. Features and characteristics of cloud computing. Security of cloud technologies, sources of threats in cloud computing. Standards in the field of cloud security. Means for securing cloud computing. Encryption, VPN-networks, authentication, user isolation.	5		v			v				
10	Information security of economic systems	Economic information as a commodity and a security object. Economic activity in the Internet. Types of security threats in economic information systems. Security policy. The main ways of unauthorized access to information. Methods and means of protection used in economic systems, their classification. Hardware security. Means of detecting information leakage channels. Firewalls. Intrusion detection systems. DLP-system. Malicious programs. Systems of data backup and recovery. Cryptographic tools. Database protection. Cloud technology and data security.	5						v	v	v	
11	Organization of protection and safety of a database	Aspects and criteria of security, security policy. Data security threats. Database protection and security, data integrity and reliability. Methods and means of protection and data protection. Develop a secure database. CASE design tools. Database administration tools. Impressions as tools to improve data security. Effect of cursors on database security. Transaction management. stored procedures. triggers. Mandatory and discretionary access control to the DBMS. Role and reports. Monitoring and audit of	5		v				v			v

		DBMS. Cryptographic tools for database protection. Replication and data recovery. High training tools.										
12	Risk management in cyber security	The program of the training course "Risk Management in Cybersecurity" is aimed at studying international and national standards for risk management in cybersecurity, methods for determining and managing risks, the practical application of standards and methods, studying specialized software systems for risk assessment.	5					v			v	
13	Scientific Python	The course studies the issues of solving high-level mathematical and technical problems using the NumPy and SciPy packages, data analysis using the Pandas package. Contributes to the development of skills in working with data: loading, filtering, transforming, analyzing and interpreting data using well-known models of classification, clustering, regression, etc. The basic methods of working with matrices and matrix operations are studied. Data visualization tools are being studied.	5	v	v							v
Experimental research work of a master's student												
14	Experimental research work of a master's student, including internship and implementation of a master's project	Systematization of theoretical knowledge, development of skills for setting tasks on the topic of research and their consistent solution. The research work includes an assessment of the objects of research, describing its problems, the allocation of a narrow area for research, conducting an experiment, analyzing the results of the experimental part, preparing and defending the EIR report and summarizing the results.	13	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 7M06303 "Comprehensive information security"
Group of educational programs M095 "IT Security"

Form of study: full-time **Duration of training:** 1 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	
								1 semester	2 semester
CYCLE OF BASIC DISCIPLINES (BD)									
M-1. Module of basic training (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	
CSE778	Algorithms for cryptographic protection of information	BD, CCH	4	120	2/0/1	75	E	4	
CSE779	Cryptographic methods and means of information protection				2/0/1				
CYCLE OF PROFILE DISCIPLINES (PD)									
M-2. Module of professional activity (university component and component of choice)									
SEC215	Organization of information security systems	PD, UC	5	150	1/1/1	105	E	5	
CSE776	Security of virtualization systems and cloud technologies	PD, CCH	5	150	2/0/1	105	E	5	
CSE268	Scientific Python				1/0/2				
SEC204	Information Security Audit	PD, CCH	5	150	2/0/1	105	E	5	
SEC245	Risk management in cyber security				2/0/1				
SEC214	Organization of protection and safety of a database	PD, CCH	5	150	2/0/1	105	E	5	
SEC209	Information security of economic systems				2/0/1				
M-3. Practice-oriented module									
AAP210	Production practice	PD, UC	9						9
M-4. Experimental research module									
AAP257	Experimental research work of a master's student, including internship and implementation of a master's project	ERWM	13						13
M-5. Module of final attestation									
ECA213	Registration and protection of the master's project	RaPMP	8						8
Total by UNIVERSITY:								30	30
								60	

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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	4	10
PD	Cycle of profile disciplines	14	15	29
	Total for theoretical training:	20	19	39
ERWM	Experimental research work of a master's student	13		13
RaPMP	Registration and protection of the master's project	8		8
	Total:	41	19	60

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.

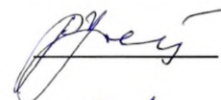
Decision of the Academic Council of the Institute Automation and Information Technologies
Protocol № 2 "21" september 2022 y.

Governing Board member - Vice-Rector for Academic Affairs



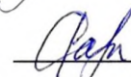
B.A. Zhautikov

Institute Director Automation and Information Technology



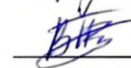
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Representative of the Council from employers



V.V. Pokusov