Institute of Technical Automation and Information TechnologiesКафедра "Cybersecurity, information processing and storage"

EDUCATIONAL PROGRAM

"7M06303 - Integrated information security"

(the cipher and the name of the educational program)

Code and classification of the field of education: 7M06 Information and communication technologies
Code and classification of training areas: 7M063 Information Security
Group of educational programs: M095 Information Security
NRK Level: 7
ORC Level: 7
Duration of study: 1 years
Volume of credits: 60 credits

Almaty 2024

The educational program "7M06303 - Integrated information security" was approved at a meeting of the Academic Council of KazNTU named after K.I.Satpayev.
Protocol No. 13 of "28" __04__2022
Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of Kazntu named after K.I.Satpayev.
Протокол № 7 от "26" _04_2022 г.

The educational program "7M06303 - Integrated information security" was developed by the academic committee in the direction "7M063 Information security"

Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of Academic Committee:				
Viktor V. Pokusov		Chairman	Kazakhstan Information Security Association	
Teaching staff:				
Ryshan Zh. Satybaldieva	Candidate of technical Sciences	Head of the Department "Cybersecurity, Information Processing and Storage", Associate Professor	NCJS "Kazakh National Research Technical University named after K.I.Satpayev", internal phone: 70-60	
Evgeniya Zh. Aitkhozhaeva	Candidate of technical Sciences, docent	Associate Professor	NCJS "Kazakh National Research Technical University named after K.I.Satpayev", internal phone: 73-61	
Galim Z. Kaziev	Doctor of technical Sciences	Professor	NCJS "Kazakh National Research Technical University named after K.I.Satpayev", internal phone: 73-61	
Dulat N. Shukaev	Doctor of technical Sciences	Professor	NCJS "Kazakh National Research Technical University named after K.I.Satpayev", internal phone: 73-61	
Birzhan I. Zhumagaliev	Candidate of technical Sciences, docent	Associate Professor	NCJS "Kazakh National Research Technical University named after K.I.Satpayev", internal phone: 73-61	
Employers:				
Amiret T. Konuspaev	Candidate of physical and Mathematical Sciences	President	Association of Innovative Companies of the Special Economic Zone "Park of Innovative Technologies"	
Orken Zh. Mamyrbayev	PhD, Associate Professor	Deputy General Director	RSE "Institute of Information and Computing Technologies"	
Students				
Atkeldy Ogan		1st year doctoral student	NCJS "Kazakh National Research Technical University named after K.I.Satpayev", mobile phone:+77076665721	

Oglavlanie

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 the 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. The purpose and objectives of the educational program

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

OP tasks:

Training of highly qualified specialists who can solve the - planning of information security audit work 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 information security incidents;
- development of a model of threats to information security in enterprises;
- development of technical specifications for the creation of an information security system.

The master's degree in educational program 7M06302 "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 activit.

3. Requirements for the evaluation of learning outcomes of the educational program

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 the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the field of education	7M06 Information and Communication Technologies
2	Code and classification of training areas	7M063 Information security
3	Group of educational programs	M095 Information security
4	Name of the educational program	7M06303 - Integrated information security
5	Brief description of the educational program	Professional activities of graduates include: education, government and departmental structures, economics and

		industry of the state, and healthcare. The objects of professional activity of graduates of master's programs in the educational program 7M06302 "Comprehensive information security" are: − 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. 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. Areas of professional activity are the following: − design, development, implementation and operation of information security systems; − analysis, testing and identification of system vulnerabilities; − information security audit
6	The purpose of the Educational program	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 educational program	New EP
8	The level of the NRK	7
9	ORC Level	7
10	Distinctive features of the Educational program	No
11	List of competencies of the educational program:	Graduates of the profile master's degree, must: 1) have an idea: – contradictions and socio-economic consequences of globalization processes : – 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. 2) know: – 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. 3) be able to: – 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 encryption; – 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. 4) have skills: – 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. 5) be competent: – 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 the educational program:	ON1. Independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities ON2. Apply in practice the knowledge of fundamental and applied sections of the disciplines that determine the direction (profile) of the master's program 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 ON4. Apply cryptographic information protection algorithms, information security standards. Ability to conduct an information security audit and implement information technology security assessment criteria. ON5. Apply resource and platform virtualization technologies, having knowledge of the principles of organizing the safe use of virtualization systems and cloud technologies. ON6. Apply database protection technologies and secure database design methods, organize a database protection and security system, and use big data analysis tools. ON7. Analyze threats and develop information security 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	Form of training	full – time. online
14	Duration of training	1 years
15	Volume of loans	60 credits
16	Languages of instruction	Kazakh, Russian,
17	Academic degree awarded	Master of Technical Sciences
18	Developer(s) and authors:	Aitkhozhaeva E.Zh., Satybaldieva R.Zh.,

4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)								
				ON1	ON2	ON3	ON4	ON5	ON6	ON7	ON8	ON9
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 activi ty. 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 image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.	2	v		v						
Cycle of basic disciplines Component of choice												

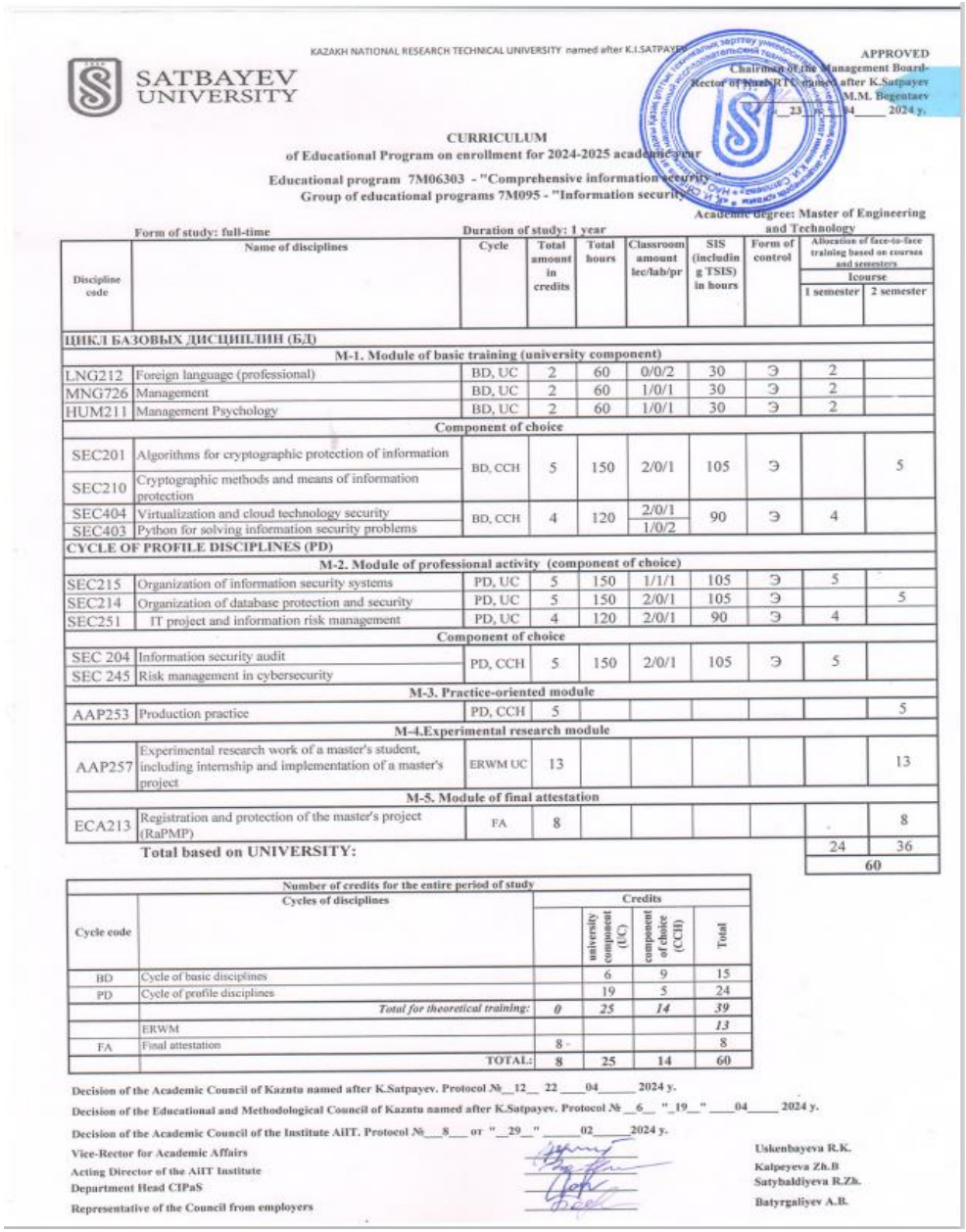
4	Algorithms for cryptographic protection of information	The modern cryptography and tasks connected to information security problems. The formal determination of the cryptosystem. Classical cryptosystems. Main objectives of crypto-analysis. Stream encryption. Cryptosystems with public key. Applications 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. Cryptofirmness 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 identification protocols.	5				v		v			
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	9	v	v							v

		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.										
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 an organization's security system	5		v		v		v		v	
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	5					v	v	v		

		security. Means of detecting information leakage channels. Firewalls. Intrusion detection systems. DLPsystem. Malicious programs. Systems of data backup and recovery. Cryptographic tools. Database protection. Cloud technology and data security										
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 DBMS. Cryptographic tools for database protection. Replication and data recovery. High training tools	5		**v**				**v**			**v**
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 student, including an	Systematization of theoretical knowledge, development of skills in setting problems on the research topic and solving them consistently. Research work includes assessing the objects of research, describing its problems,	13	**v**	**v**							**v**

	internship and the implementation of a master's projec	identifying a narrow area for research work, conducting an experiment, analyzing the results of the experimental part, preparing and defending a report on the EIR and summing up the results										

5. Curriculum of the educational program



KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of NazNRTU named after K.Satpayev
M.M. Begentaev
"23" 04 2024 y.

CURRICULUM
of Educational Program on enrollment for 2024-2025 academic year

Educational program 7M06303 - "Comprehensive information security"
Group of educational programs 7M095 - "Information security"

Academic degree: Master of Engineering and Technology

Form of study: full-time **Duration of study: 1 year**

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters	
								Course	
								1 semester	2 semester
ЦИКЛ БАЗОВЫХ ДИСЦИПЛИН (БД)									
M-1. Module of basic training (university component)									
LNG212	Foreign language (professional)	BD, UC	2	60	0/0/2	30	Э	2	
MNG726	Management	BD, UC	2	60	1/0/1	30	Э	2	
HUM211	Management Psychology	BD, UC	2	60	1/0/1	30	Э	2	
Component of choice									
SEC201	Algorithms for cryptographic protection of information	BD, CCH	5	150	2/0/1	105	Э		5
SEC210	Cryptographic methods and means of information protection								
SEC404	Virtualization and cloud technology security	BD, CCH	4	120	2/0/1	90	Э	4	
SEC403	Python for solving information security problems				1/0/2				
CYCLE OF PROFILE DISCIPLINES (PD)									
M-2. Module of professional activity (component of choice)									
SEC215	Organization of information security systems	PD, UC	5	150	1/1/1	105	Э	5	
SEC214	Organization of database protection and security	PD, UC	5	150	2/0/1	105	Э		5
SEC251	IT project and information risk management	PD, UC	4	120	2/0/1	90	Э	4	
Component of choice									
SEC 204	Information security audit	PD, CCH	5	150	2/0/1	105	Э	5	
SEC 245	Risk management in cybersecurity								
M-3. Practice-oriented module									
AAP253	Production practice	PD, CCH	5						5
M-4.Experimental research module									
AAP257	Experimental research work of a master's student, including internship and implementation of a master's project	ERWM UC	13						13
M-5. Module of final attestation									
ECA213	Registration and protection of the master's project (RaPMP)	FA	8						8
Total based on UNIVERSITY:								24	36
								60	

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	5	24
	Total for theoretical training:	*0*	*25*	*14*	*39*
	ERWM				*13*
FA	Final attestation	8			8
	TOTAL:	8	25	14	60

Decision of the Academic Council of Kaznu named after K.Satpayev. Protocol №__12__ 22 ____04_____ 2024 y.
Decision of the Educational and Methodological Council of Kaznu named after K.Satpayev. Protocol № __6__ "_19__" ____04_____ 2024 y.
Decision of the Academic Council of the Institute AiIT. Protocol №__8___ от "__29__" _____02_____2024 y.

Vice-Rector for Academic Affairs Uskenbayeva R.K.
Acting Director of the AiIT Institute Kalpeyeva Zh.B
Department Head CIPaS Satybaldiyeva R.Zh.
Representative of the Council from employers Batyrgaliyev A.B.