Ф.7.02-09

MINISTRY OF SCIENCES AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M.O. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»
Chairman of the board –
Rector _____
Docter of historical sciences,
Academician, Kozhamzharova D.P.
«__» _____2023

EDUCATIONAL PROGRAM

6B06121–«Technologies of artificial intelligence»

Registration number	6B06100277
Code and classification of the field of education	6B06 Information and Communication Technology
Code and classification of areas of training	6B061 Information and communication technology
Group of educational programs	B057 Information technology
EP type	Acting
ISCE level	6
NQF level	6
IQF level	6
Language of instruction	Kazakh, Russian, English
The complexity of the EP, not less	240 credits
Distinctive features of the EP	-
Partner university (JEP)	-
Partner university (DDEP)	-

Shymkent, 2023

Developers:

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Utegenov Musakhan Kalaubekovich	Director of the Higher College of new technologies named after Manap Utebayev	Stamp

The EP was considered in the direction of training information and communication technologies at a meeting of the academic committee, protocol № 7 «21» 02 2023y.

Chairman of the Committee _____ Shertayev E.T.
Signature

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU , protocol № 4 «22» 02 2023 y.

Chairman of the EMC _____ Abisheva R. D.

The EP was approved by the decision of the Academic Council of the University protocol № 13 «23» 02 2023 y.

CONTENTS

1 CONCEPT EP

Mission of the University	We are focused on generating new competencies, training a leader who translates research thinking and culture.
University Values	– Openness - open to change, innovation and cooperation. – Creativity - generates ideas, develops them and turns them into values – Academic freedom - free to choose, develop and act. – Partnership - creates trust and support in a relationship where everyone wins. – Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.
Graduate Model	– Deep subject knowledge, their application and continuous expansion in professional activity – Information and digital literacy and mobility – Research skills, creativity and emotional intelligence – Entrepreneurship, independence and responsibility for their activities and well-being – Global and national citizenship, tolerance to cultures and languages
Uniqueness of the EP	the program was developed in accordance with the Atlas of New Professions and Competencies, and is aimed at training competent specialists for transport and logistics and scientific and pedagogical structures who are able to organize and manage the activities of a structural enterprise, independently determine the goals of professional activity, choose and justify methods and means to achieve them.
Academic Integrity and Ethics Policy	The University has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination: • Rules of academic integrity (Order No. 212-нқ dated 10.10.2022); • Anti-Corruption Standard (Order No. 221-нқ dated 07.12.2021). • Code of Ethics (order No. 212-нқ dated 10.10.2022). • Anti-Corruption Policy of the NJSC “M. Auezov South Kazakhstan University.” (order No. 144 пқ dated 07.14.2022).
Regulatory and legal framework for the development of EP	1. Law of the Republic of Kazakhstan "On Education" No. 319-III dated July 27, 2007; 2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 3. State obligatory standards of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated July 20.2022 No. 2; 4. Rules for the organization of the educational process on credit technology of training, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152; 5. Qualification directory of positions of managers, specialists and other employees, approved by the Order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan on December 30, 2020 No. 553. 6. Guidelines for the use of ECTS.

	7. Guidelines for the development of educational programs of higher and postgraduate education, Appendix 1 to the order of the Director of the Central Research Institute No. 45 o/d dated June 30, 2021.
Organization of the educational process	– Implementation of the principles of the Bologna Process – Student-centered learning – Availability – Inclusivity
Quality assurance of EP	– Internal quality assurance system – Involvement of stakeholders in the development of the EP and its evaluation – Systematic monitoring – Updating the content (updating)
Requirements for applicants	They are established according to the Standard Rules of admission to training in educational organizations implementing educational programs of higher and postgraduate education Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated 31.10.2018
Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs(SSN)	For students with SEN (special educational needs) and persons with disabilities (PSI), tactile PVC tiles, specially equipped toilets, a mnemonic diagram, and shower bars have been installed in educational buildings and student dormitories. Special parking spaces have been created. Crawler lift installed. There are desks for people with limited mobility (PLM), signs indicating the direction of movement, ramps. In the educational buildings (main building, building No. 8) there are 2 rooms with six working places adapted for users with disorders of the musculoskeletal system (DMS).For visually impaired users, the SARA™ CE Machine (2 pcs.) is available for scanning and reading books. The library website is adapted for the visually impaired. There is a special NVDA audio program with a service. The JIC website http://lib.ukgu.kz/ is open 24/7. An individual differentiated approach is provided for all types of classes and in the organization of the educational process.

2 PASSPORT OF THE EDUCATIONAL PROGRAM

Goal EP	Training of highly qualified, multilingual specialists with critical thinking, ready for professional activities in the digitalization of various sectors of the economy, possessing advanced knowledge in the field of IT technologies.
Tasks EP	- formation of socially responsible behavior in society, a high general intellectual level of development, mastery of literate and developed speech, multilingualism, a culture of thinking, understanding the importance of professional ethical standards and following these standards; - providing lifelong learning skills that will enable them to successfully adapt to changing conditions throughout their professional careers; - formation of the competitiveness of graduates in the field of information technology to ensure the possibility of their fastest possible employment in their specialty or continuing education at subsequent levels of education; constant feedback with stakeholders and ensuring their requests.
EP harmonization	• 6th level of the National Qualifications Framework of the Republic of Kazakhstan; • Dublin Descriptors 6 skill level; • 1 cycle of the Qualification Framework of the European Higher Education Area (A Framework for Qualification of the European Higher Education Area); • Level 6 of the European Qualification Framework for Lifelong Learning (The European Qualification Framework for Life long Learning).
Communication of the EP with the professional sphere	**Professional standard: "Development of artificial intelligence applications."** Appendix No. 17 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 222 dated 05.12.2022 **Professional standard "Testing Web and multimedia applications"**. Annex No. 36 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated December 24, 2019 No. 259 **Professional standard: "Administration of graphics and operating systems."** Appendix No. 13 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 222 dated 05.12.2022 **Professional Standard: Software Maintenance.** Annex No. 20 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs Republic of Kazakhstan "Atameken" No. 222 dated 05.12.2022 **Professional standard "Database Administration"**. Annex No. 1 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 222 dated 05.12.2022 **Professional standard: "Conducting web monitoring".** Appendix No. 6 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 222 dated 05.12.2022

Name of the degree awarded	After the successful completion of this EP, the graduate is awarded the degree: "Bachelor in Information and Communication Technologies in the educational program 6B06121 – "Artificial Intelligence Technologies".
List of Qualifications and Positions	Primary positions: Artificial Intelligence Engineer (NKZ code 2519-9-001); Application programmer (NKZ code 2519-9-002); Web developer (code according to NKZ 2512-2-001); Web page developer (code according to NKZ 2512-2-002); Application developer (NCZ code 2512-2-004); Graphical interface layout specialist (NKZ code 2512-2-004); Graphical interface architecture development specialist (NKZ code 2512-2-004); Web-master (code according to NKZ 2512-2-004); Graphic systems administrator (NCZ code 2523-0-001); Operating systems administrator (NCC code 2523-0-004); Software maintenance specialist (NCC code 2513-0-0041); Database administrator (NCZ code 2519); Web analytics specialist; Specialist in BI - systems;
Professional Field of Activity	Government and private enterprises and organizations utilizing automated information systems in various areas of economic activity. Research, design, development, testing, implementation, and maintenance of information and communication systems.
Objects of Professional Activity	Enterprises and organizations of various ownership forms that develop, implement, and operate information systems in various fields of human activity.
Subjects of Professional Activity	theoretical and practical knowledge on: - development of intelligent information systems (pattern recognition; machine learning; computational linguistics); - mathematical, informational, software, linguistic, technical, organizational and legal support of intelligent information systems, including technologies for designing, developing, implementing, maintaining and operating them.
Theoretical and practical knowledge in:	● Project and design ● Production and technological ● Organizational and managerial ● Operational ● Commercialization of ICT services.
Learning Outcomes	**LO1**: Communicate freely in the professional environment and society in Kazakh, Russian and English, taking into account the principles of academic writing and the culture of academic honesty. **LO2**: Apply natural science, mathematical, social, socio-economic, and engineering knowledge in professional activities, use methods of mathematical data processing, scientific and experimental research, normative documents, and elements of economic analysis. **LO3**: Demonstrate the ability to develop, test, implement, and support all types of ICT project deliverables according to standards. **LO4**: Apply the apparatus of machine learning (artificial neural networks) in the development of artificial intelligence systems; evolutionary and genetic algorithms; basic digital twin development skills **LO5**: Program in environments such as C# for web service development, Python in the Django framework, Java, JavaScript for web application development, iOS, Android for mobile application development. **LO6**: Describe the basic principles of information security in information

	systems, recommendations for the practical implementation of technical information security during the design and implementation of information processes on various devices. **LO7**: Perform installation and maintenance of graphical and operating systems, ensuring the functioning and information security of databases. **LO8**: Develop design, create and modify web resources, integrate web resources with other computer applications, administer and update web resources. **LO9**: Apply mathematical tools for decision making and optimization in management tasks of automatic and automated control. **LO10**: Describe the functioning of IT infrastructure of an organization, the normal operation, and security of operating systems, network operating systems, and database management systems. **LO11**: Demonstrate practical application and configuration of the software product "1C: Enterprise" for accounting and management accounting automation of an enterprise. **LO12**: Collect, analyze, and process big data, applying Big Data and Data Mining technologies. **LO13**: Work effectively individually and as a team member, demonstrate self-defense and self-improvement skills, and maintain a healthy lifestyle.

3 COMPETENCES OF THE OP GRADUATE

GENERAL COMPETENCES (SOFTSKILLS). Behavioral skills and personality traits	
GE 1. Competence in managing one's own literacy	GE1.1. Ability to self-learn, self-develop, and continuously update knowledge within the chosen trajectory and in the context of interdisciplinarity. GE1.2. Ability to express thoughts, feelings, facts, and opinions in the professional sphere. GE1.3. Ability to adapt to mobility in the modern world and engage in critical thinking.
GE 2. Language competence	GE2.1. Ability to establish communication programs in the official, Russian, and foreign languages. GE2.2. Ability to engage in interpersonal, social, and professional communication in the context of intercultural communication
GE 3. Mathematical competence and competence in the field of science	GE3.1. Ability and willingness to apply the educational potential, experience, and personal qualities acquired during the study of mathematical, natural science, and technical disciplines at the university to solve professional tasks.
GE 4. Digital competence, technological literacy	GE4.1. Ability to demonstrate and develop information literacy through the mastery and use of modern information and communication technologies in all areas of life and professional activities. GE4.2. Ability to use various types of information and communication technologies, including internet resources, cloud and mobile services, for searching, storing, protecting, and disseminating information.
GE 5. Personal, social, and study competences	GE5.1. Ability to engage in physical self-improvement and adopt a healthy lifestyle to ensure full social and professional functioning through the methods and means of physical education. GE5.2. Ability to achieve social and cultural development based on citizenship and moral values. GE5.3. Ability to develop a personal learning trajectory throughout life for self-development, career growth, and professional success. GE5.4. Ability to successfully interact in diverse socio-cultural contexts during studies, work, home, and leisure activities.
GE 6. Entrepreneurial competence	GE6.1. Ability to demonstrate creativity and entrepreneurship in various environments. GE6.2. Ability to work in conditions of uncertainty and rapid changes, make decisions, allocate resources, and manage one's time effectively. GE6.3. Ability to work with consumer demands.
GE 7. Cultural awareness and self-expression skills	GE7.1. Ability to demonstrate a worldview, civic, and moral positions. GE7.2. Ability to be tolerant of the traditions and culture of other nations, possess high spiritual qualities.
PROFESSIONAL COMPETENCES (HARDSKILLS).	
Theoretical knowledge and practical skills specific to this area	**PC1** Ability to implement artificial intelligence systems; trial operation of artificial intelligence systems and its implementation; designing artificial intelligence systems; development and software implementation of the artificial intelligence system; **PC2** Ability to develop design; create and modify web resources; integrate web resources with other computer applications; layout web pages, fill them with content; administer and update web resources;

	develop, maintain applications and draw up related technical documentation
	PC3 Ability to design and develop a graphical interface; design and research the architecture of the graphical interface, providing high operational (ergonomic) characteristics of software products and systems; perform work on the creation (modification) and maintenance of web resources
	PC4 Ability to configure and support graphic systems; ensure reliable operation of the OS
	PC5 Ability to monitor the software product to detect errors and eliminate them; organize software upgrades
	PC6 Ability to install and configure software; ensure the functioning of the database; monitor and manage database backups; provide database IS; analyze and tune DBMS performance; ensure the smooth operation of the DBMS; manage database development
	PC7 The ability to independently collect and analyze data about site visitors; analyze data from the data warehouse
	PC8 Ability to develop terms of reference for the project along with the specification, detailing the requirements of the customer; advising programmers and testers during product development
	PC9 The ability to solve all issues related to the stages of the technological process, labor safety in production, environmental protection.

3.1Matrix of correlating learning outcomes in the EP as a whole, with the formed competencies

	RC1	RC2	RC3	RC4	RC5	RC6	RC7	RC8	RC9	RC10	RC11	RC12	RC13
GE1		+											
GE2	+												
GE3		+									+		
GE4		+											
GE5													+
GE6		+										+	
GE7													+
PC1				+	+				+				
PC2			+		+			+					
PC3					+								
PC4					+	+							
PC5						+							
PC6						+	+			+			
PC7												+	
PC8			+										
PC9		+											+

4 MATRIX OF INFLUENCE OF MODULES AND DISCIPLINES ON THE FORMATION OF LEARNING OUTCOMES AND WORKLOAD INFORMATION

№	Module Title	cycle	component	Course name	Brief description of the discipline	Number of credits	RC 1	RC 2	RC 3	RC 4	RC 5	RC 6	RC 7	RC 8	RC 9	RC 10	RC 11	RC 12	RC 13
1	Fundamentals of Social Sciences	GED	CC	History of Kazakhstan	**Purpose:** is the formation of an objective idea of the history of Kazakhstan based on a deep understanding and scientific analysis of the main stages, patterns, originality of the historical development of Kazakhstan. **Contents**: Ancient people and the formation of a nomadic civilization. Turkic civilization and the great steppe. Kazakh Khanate. Kazakhstan in the era of modern times. Kazakhstan as part of the Soviet administrative-command system. Independent Kazakhstan. State system, socio-political development, foreign policy and international relations. Methods and techniques of historical description.	5		v												
		GED	CC	Philosophy	**Purpose**: Formation of students' holistic view of philosophy as a special form of knowledge of the world, philosophical reflection, skills of introspection and moral self-regulation. **Contents**: The emergence of a culture of thinking. The subject and method of philosophy. Fundamentals of philosophical understanding of the world. Philosophy of man and the world of values. Ethics. Philosophy of values. The subject of aesthetics as a field of philosophical knowledge. Philosophy of freedom, art, history, religion. "Mangilik El" and "Modernization of public consciousness" is a new Kazakh philosophy.	5		v												v
2	Socio-political knowledge	GED	CC	Sociology and political science	**Purpose**: formation of knowledge about socio-political activity, explanation of socio-political processes and phenomena. **Contents:** Consideration of the socio-ethical values of societies. Understanding the features of social, political, cultural, psychological institutions, their role in the modernization of Kazakhstani society. Making decisions to resolve conflict situations. Studies of political institutions and processes, methods of analysis and	4		v												

					interpretation of ideas about politics, power, state, society, the use of methods of sociological, corporate analysis, understanding the essence and content of the political situation in the modern world.														
		GED	CC	Culturology and psychology	**Purpose**: Formation of scientific knowledge of history, modern trends, current problems and methods for the development of culture and psychology, skills of systemic analysis of psychological phenomena. **Contents:** Morphology, language, semiotics, anatomy of culture. Culture of nomads, proto-Turks, Turks. Medieval culture of Central Asia. Kazakh culture at the turn of the XVIII - XIX centuries, XX century. Cultural policy of Kazakhstan. State Program "Cultural Heritage". National consciousness, motivation. Emotions, intellect. The will of man, the psychology of self-regulation. Individual typological features.	4		v											
3	Socio-ethical development	GED	CC	Ecosystem and Law	Purpose: formation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, methods of scientific research. Content: fundamentals of safe interaction between man and nature, productivity of ecosystems and the biosphere. Entrepreneurial activity in conditions of limited resources, increasing the competitiveness of business and the national economy. Regulation of relations in the field of ecology and human life safety. Knowledge and observance of Kazakhstan law, obligations and guarantees of subjects, state regulation of public relations to ensure social progress. Application of scientific research methods..	5		v											
		DB	KQ	Actual Problems and Modernization of Public Consciousness	**Purpose:** The purpose of the discipline is the restoration of spirituality, deformed during the periods of tsarist and Soviet reality, the formation of a creative personality based on the modernization of the public consciousness of young people. **Contents:** Spiritual modernization: origin and background. Modern national identity. Pragmatism and competitiveness. National identity and national code. Experience and prospects of evolutionary development. The triumph of knowledge and openness of consciousness. Alphabet Reform: Experience and Priorities. Fatherland is the basis of the state. Education through nationwide sacred	3		v											

					places and history. Modern Kazakh culture is the cornerstone of spiritual revival. New humanitarian education and the future national intelligentsia. Abai Kunanbaev and Kazakh society.														
		BD	EC	Mukhtar Studies	**Purpose:** to form a historical, literary idea of M. Auezov's work in the context of literary history, patriotism and cultural and spiritual position. Development of artistic thinking, skills of independent research activity. **Content:** the life and creative path of M. Auezov Semipalatinsk, Tashkent, St. Petersburg periods. M. Auezov's activity in the magazines "Sholpan", "Abai". M. Auezov's journalism. An artistic review of the short stories "Korgansyzdyn kuni", "Kyr suretteri", "Okagan azamat", "Kokserek", the play Enlik-Kebek and the stories "Kili Zaman", "Karash-Karash" okigasy", the monograph "Abai Kunanbayev", the epic novel "Abai Zholy".			v											
		DB	KQ	Abai Studies	**Purpose:** preservation of the “national code” in the project “Kazakhtanu” based on the creativity of A. Kunanbayev **Content:** historical overview of the history of Kazakhstan and Kazakh literature of the XIX-XX centuries. Studies of Abai's legacy of the XX-XXI century. Chronology of Abai's creativity. Abai is a great poet, ethnographer, founder of Kazakh written literature. Abai is the compiler of the code of laws “The Position of Karamola”, social significance. Abai is a thinker, religious scholar, philosopher. The role of Abai in education and science, the concept of a “Holistic person”. “Words of Edification” by Abai, an epic novel by M.Auezova “The Way of Abai”. K. Tokayev “Abai and Kazakhstan in the XXI century”, role, significance.			v											
				Service to Society	**Purpose:** formation of socially significant skills and competencies based on the assimilation of academic programs, carrying out socially useful activities related to the disciplines studied at the university. **Content:** the concept and meaning of Service learning, the history of the formation and development of the concept of Service Learning. The key components of Service Learning, socially useful activities in children and youth, the organization of the volunteer movement in the world and Kazakhstan practice, the profile orientation of Service		v	v										

					Learning. International practice of learning through socially useful activities. General principles and methodology for the development of social projects. Methods of analysis of implemented social projects														
				Fuundations of Anti-Corruption Culture	**Purpose:** formation of an anti-corruption worldview, strong moral foundations of personality, civic position, stable skills of anti-corruption behavior. **Content:** overcoming legal nihilism, formation of the foundations of the legal culture of students, in the field of anti-corruption legislation. Formation of conscious perception, attitude to corruption. Moral rejection of corrupt behavior, corrupt morality, ethics. Mastering the skills necessary to counter corruption. Creating an anti-corruption standard of conduct. Anti-corruption propaganda, dissemination of ideas of legality, respect for the law. Activities aimed at understanding the nature of corruption, awareness of social losses from its manifestations, the ability to defend one's position in a reasoned manner, to look for ways to overcome manifestations of corruption.		v	v											
4	Module: Communications and Physical Education	GED	CC	Kazakh (russian) language	**Purpose:** To develop communicative competence using the Kazakh (Russian) language in social-cultural, professional, and public spheres, and to enhance the ability to write academic texts. **Content:** Levels A1, A2, B1, B2-1, B2-2 (B2, C1 for Russian language) are presented in the form of cognitive-linguistic-cultural complexes of international standards, including social-domestic, socio-cultural, educational-professional components, simulated communication forms, written speech works, and listening. The module aims to demonstrate understanding of language materials in texts, mastery of terminology, and the development of critical thinking skills.	10	v											
		GED	CC	Foreign Language	**Purpose:** To develop students' intercultural communicative competence through foreign language education at the sufficient level of A2 and the level of basic proficiency B1. **Content:** Levels A1, A2, B1, B2 are presented as cognitive-linguistic-cultural communication complexes of international standards, including social-domestic, socio-cultural, educational-professional components, simulated	10	v											

					forms of oral and written communication, written speech works, and listening. The module aims to demonstrate understanding of language materials in texts according to the educational program, mastery of terminology, and the development of critical thinking skills.														
		GED	CC	Physical Education	**Purpose:** To develop social and personal competencies and the ability to purposefully utilize the means and methods of physical education for the preservation and enhancement of health in preparation for professional activities. **Content**: Implementation of physical education and training programs. General developmental and specific exercises. Types of sports (gymnastics, sports and active games, athletics, etc.). Monitoring and self-monitoring during classes, safety measures and self-protection. Officiating competitions. Means of professional and applied physical training. Modern health improvement systems.	8													v
		BD	UC	Professional Kazakh (Russian) Language	**Purpose:** To provide professionally-oriented language training for specialists who are capable of effectively communicating in professionally significant situations and possess language norms for specific purposes. **Content:**Professional language and its components. Professional terminology as a key characteristic of scientific style. Scientific vocabulary and constructions in educational-professional and scientific-professional domains. Algorithm for analyzing and producing scientific texts in the field of specialization. Production of scientific-professional texts. Basics of business communication and documentation within future professional activities.	3	v												
		BD	UC	Professional-oriented Foreign Language	**Purpose:** To develop foreign language communicative competence that is professionally oriented, enabling integration into the international professional environment and utilizing English as a means of intercultural and professional communication. **Content:** The professional-oriented approach to teaching foreign languages in non-linguistic faculties of universities ensures the development of students' abilities to communicate in specific professional, business, and scientific spheres and situations, taking into account the	3	v												

					characteristics of professional thinking. This approach involves organizing motivational and research activities to stimulate students' engagement and orientation.														
		GED	CC	Information and Communication Technologies	**Purpose:** To develop the ability to critically evaluate and analyze processes through the use of digital technologies. To foster a new "digital" mindset and acquire knowledge and skills in using modern information and communication technologies. **Content:** Introduction and architecture of computer systems. Software. Operating systems. Human-computer interaction. Database systems. Database management. Networks and telecommunications. Cybersecurity. Internet technologies. Cloud, mobile, multimedia, smart, and electronic technologies. E-business and management.	5		v											
5	Mathematical and natural science foundations	DB	EC	Physics	**Purpose:** To develop knowledge of physical laws and skills for their application in engineering and computer technology, to cultivate the ability to conduct and evaluate results of theoretical and experimental research, and to foster scientific thinking based on an interdisciplinary approach. **Content**: Laws of classical and modern physics (mechanics, molecular physics, thermodynamics, electromagnetism, optics, quantum and atomic physics). Application of knowledge of physical phenomena and processes to solve applied, technical, and technological problems based on an interdisciplinary approach. Scientific research methods, planning, conducting, processing, and analyzing results of theoretical and experimental research.	5		v											
		DB	EC	Algebra and Geometry	**Purpose:** To acquire knowledge in mathematics necessary for studying related engineering disciplines and specialized courses, and to develop mathematical methods and mathematical intuition that enable solving applied problems related to future profession. **Content**: Vectors, matrices and operations on them, determinants, inverse matrices, systems of linear algebraic equations and methods of their solution, lines on the plane, planes and lines in space, general theory and canonical equations of curves and second-order surfaces	4		v											
		BD	UC	Mathematical analysis	**Purpose**: Formation of knowledge in mathematics necessary for the study of related engineering disciplines	4		v											

					and special courses, for the development of mathematical methods and mathematical intuition, which teach to solve applied problems related to the future profession **Contents:** Set and function. Function limit. Remarkable limits. Function derivative. Antiderivative function and indefinite integral. Definite integral. Applications of a definite integral. Function of several variables. First order differential equations. Higher order differential equations. ranks														
		BD	EC	Theory of Probability and Mathematical Statistics	**Purpose**: Formation of theoretical knowledge on the theory of probability and the basics of mathematical statistics. **Contents**: Basic laws and provisions of the theory of probability and mathematical statistics. Practical skills are instilled in calculating probability within the framework of the classical approach and using basic formulas, finding distribution laws and numerical characteristics of both random variables (single and multidimensional) and functions of random variables, estimating distribution parameters and testing statistical hypotheses.	4		v											
		BD	EC	Fundamentals of econometrics	**Purpose**: Formation of knowledge on the basics of econometrics for the analysis of economic processes **Contents:** Basic laws and provisions of econometrics: conceptual and terminological base of probability theory; description of random variability in economic processes. Practical skills of calculation of probabilistic distribution and numerical characteristics of random variables are inculcated; use econometric methods to analyze the state and to assess the patterns of development of economic and social systems in terms of the relationship between the factors that describe them.			v											
		BD	EC	Content and Language Integrated Learning	**Purpose:** Formation of skills in the use of professional terminology **Content:** Professional terminology used in software, databases and knowledge bases, information security and information protection, IS development, optimization models and methods, computer networks, graphics and animation tools, WEB-design, computer computing. Application of terminology in practical classes in a group and individually.	4		v											
		BD	EC	Fundamentals of	**Purpose:** Developing skills for independent research work		v												

				Academic Writing	for students to create a text in a chosen scientific genre. **Content:** Develop skills and abilities to plan the text of the study; write an annotation, research abstract; make a review of the literature used in a scientific project; quote correctly, avoid plagiarism; use statistical data in their written work, including those presented graphically; edit what is written make bibliographic lists; make a presentation of your own project; conduct business correspondence														
6	Basics of programming	BD	UC	Algorithmization and programming	**Purpose:** mastering the skills of developing algorithms, methods and technology for solving practical and scientific problems in the Python language (1st level) **Contents:** PC software. The concept of an algorithm. Basic structures of algorithms. Methods for describing algorithms. Linear structure algorithms. Branching structure algorithms. Cyclic structure algorithms. Operations of the Python language. Linear structure programs. Branching structure programs. Lists. Strings. Tuples. Working with a function. Recursion. two-dimensional arrays. Sets. Dictionaries. Modules. Working with files. Graphic arts	5		v			v								
		BD	EC	Technologies of Programming	**Purpose**: Acquisition by students of fundamental theoretical and practical knowledge in the process of studying the basics of programming technology in the C # language (1st level) **Contents**: Programming technology. Introduction to the C# programming system. Expressions and assignments. C# language operators. Conditional operator. Loop operators. Precondition operator. Postcondition operator. An operator with a parameter. foreach statement. One-dimensional arrays. two-dimensional arrays. Procedures are methods of a class. Functions are class methods. Strings. Graphic arts. Classes. Files.	5		v			v								
		BD	EC	Introduction to Specialty	**Purpose:** Formation of ideas about the future specialty, the prospects for its development, and the features of professional training in the specialty. **Contents:** The main aspects of professional training of future specialists in the system of higher professional education. Fundamentals of design and maintenance of information systems by areas of application; review of artificial intelligence technologies. The skills of using	4	v												

					information resources and software and hardware are developed, the motivation for self-learning and development is formed.														
				Educational practice	**Purpose:** Consolidation of knowledge and skills in the basics of algorithmization and programming technologies in C#, Python, Java environments. **Content:** Expansion and deepening of the obtained theoretical knowledge on the development of algorithms and their programming; acquisition of initial practical skills and competencies in the field of professional activity, in solving specific problems. The use of the basic laws and provisions of algorithmization and programming in the C#, Python, Java environment when performing an individual task.	1		v			v							
7	Intelligent information systems software	DB	EC	Object Oriented Programming	**Purpose:** Formation of in-depth knowledge and skills in programming in the Python environment (2nd level) **Contents:** Classes and objects. Inheritance, polymorphism, encapsulation, abstraction of functions and variables. Multiple inheritance and visible variable scope. Connecting to a SQLite database. Creating database queries within the program. Creating and making changes to the database through the program console. Displaying the database through the application. Design patterns; working with databases, application development	5		v			v							
		PD	EC	Evolutionary modeling	**Purpose:** Formation of skills in the application of intelligent methods for solving various problems in industry, economics, medicine, etc. **Contents:** Multilayer neural networks and learning algorithms. Adapine type systems. Backpropagation algorithm. Fuzzy sets and fuzzy inference. Operations on fuzzy sets. Generalized fuzzy rules: modus ponens; modus rollens. Fuzzy implication rules. Takagi-Sugeno fuzzy control method. Genetic algorithms and traditional optimization methods. Classic fuzzy control module.	4				v	v							
		PD	EC	Genetic programming	**Purpose:** Mastering heuristic behavioral algorithms for solving optimization problems **Contents:** General scheme of evolutionary algorithms. Individual coding. Operations of mutation, crossing and selection. Genetic operators. Typical genetic algorithms. genetic programming. Theory shim. Genetic					v	v							

					Coevolutionary Algorithm. Biological bases. Overview of immune optimization methods: CLONALG, opt-AiNet, BCA, HIA, I-opt-AiNet, T-Cell Model methods. Optimization with the help of the immune network. Algorithm based on artificial microimmune system.														
		BD	EC	Programming in Java Environment	**Purpose:** Acquisition of skills in Java programming technology (1st level) **Contents:** Introduction to the Java programming system. The composition of the programming system, elements of the language. Java Language Operations. Linear structure programs. Conditional if statement. switch variant operator. Branching structure programs. for statements; while; while. Arrays. Strings. String class. Graphic arts. Class and object creation. Static Methods in Java. Packages and interfaces.	4		v			v								
		BD	EC	Structured Query Language SQL	**Purpose:** Formation of knowledge and skills in the use of visual query building tools **Contents:** SQL data types, data selection (SELECT statement), ordering output fields, data manipulation, creating database tables, SELECT for specific columns. Modeling the logical structure of data: determining the composition of data, structure and data sources; database structure design. Definition of the logical structure and physical implementation of data; generating data using queries from the database for the report; preparation of an analytical report								v						
8	Theoretical foundations of intelligent information systems	BD	EC	Basis of Information Systems	**Purpose:** Formation of knowledge and skills on the basics of designing information systems. **Contents:** Fundamentals of systems theory and system analysis; composition and general structure of information systems, key components of information systems, class diagrams, usage, interactions and other diagrams. The device and functioning of IS and the principles of interaction of IS components. Basic models of architectures of modern computing systems and networks. Life cycle and software development methodologies. Procedure and principles of software documentation. The composition of the hardware-software complex.	5		v	v										
		BD	EC	Basis of	Goal: Mastering the methods of efficient coding			v	v										

				Information Theory	**Contents:** Basic laws and provisions of information theory: theoretical foundations for measuring information, transmitting information, discretizing and quantizing information, representing information in human-machine systems; methods of efficient and noise-resistant coding of information, methods of analog-to-digital conversion of signals, basic color formation systems, methods of digital data compression; efficient coding technique according to Huffman; data coding in an error-correcting Hamming code.													
		BD	EC	Information Security and Data Protection	**Purpose:** Teaching the principles, methods and means of implementing data protection, mastering the theoretical foundations of cryptographic protection of electronic information **Contents:** Classification of methods, means and objects of information protection. Software protection from unauthorized access. Protection of information in open networks. Permutation ciphers. Encryption of information using a simple replacement cryptographic algorithm. Encryption of information using a complex substitution cryptographic algorithm. Encryption of information using cryptographic gamming algorithms. Block encryption systems	5						v							
		DB	KQ	Cryptographic methods of information protection	**Purpose:** mastering the theoretical foundations of cryptographic protection of electronic information, as well as the formation of practical skills in the use of symmetric and asymmetric cryptographic systems **Contents:** The concept of cryptography. Types of encryption. Permutation ciphers. Simple substitution ciphers. Encryption of information using a complex replacement algorithm. Encryption by gamma method. Block encryption systems. Stream encryption systems. Asymmetric cryptosystems. Digital signature schemes. cryptographic protocols. Hash functions and message authentication. Key management							v							
9	Technical means of intelligent information	BD	EC	Fundamentals of the theory of artificial neural networks	**Purpose:** Formation of knowledge in the field of development of intelligent information systems and skills in the use of machine learning apparatus **Contents:** Basic concepts of the theory of neural	5				v	v								

	systems				networks. Standard architectures of neural networks. Classification of learning algorithms. A network of one neuron. Layered architectures. Perceptron Rosenblatt. Radial neural network. Methods for training neural networks. Kohonen network, counterpropagation network, hybrid network. Associative memory neural networks. Hopfield model. Hobb's learning rule.														
		BD	EC	Methods for constructing artificial neural networks	**Purpose:** Formation of skills in the synthesis of neural networks and their practical application **Contents:** Artificial neural networks. Building networks using the MATLAB PPP. Methods and algorithms for learning ANN. perceptron networks. Linear neural networks. Radial basic networks: general; type GRNN; PNN type. Self-organizing layers and Kohonen maps. Self-organizing LVQ networks. Elman recurrent neural networks. Hopfield networks and their application for pattern recognition and associative memory creation.					v	v								
		BD	EC	Operating systems, environments and shells	**Purpose:** Mastering the skills of OS and DBMS system administration. **Contents:** Basic laws and regulations of Operating systems: composition, functions, classification, installation and configuration, kernel, shell program services, dispatcher. Network adapters. Physical structuring of the local network. Microsoft OS family. History of Windows. Windows versions. Areas of use for Windows. Structure: NT executive and protected subsystems. Multiple application environments. Object-oriented approach. Network tools. Fundamentals of system administration of OS and DBMS.	5							v			v			
		BD	EC	Fundamentals of scientific research in the field of information technology	**Purpose:** Formation of knowledge in the field of information technology, the current state and the implementation of scientific research; understanding the directions of development by profile. **Contents:** Creativity in scientific and design work. Methods of scientific research in technology. Classification of research methods. Feasibility study and research. Information and patent search. Setting up an experiment. Systematization of information. Research			v											

					planning. Experiment in research. Mathematical processing of the results of the experiment. Registration of research results. Analysis of the results of the experiment. Preparation of a research report.														
		BD	EC	Programming on Django Platform	**Purpose:** Students will gain basic skills in designing and developing Web applications on the Django platform, as well as testing and debugging skills (Python level 3) **Contents:** Django application structure. Installing and configuring Django. Working with Forms in Django model forms. Django templating basics. Filters. Views as an implementation of the controller in the MVC model. Representations in the form of functions. Named and positional view arguments. Views based on classes. Authorization, authentication, registration.	4					v								
		BD	EC	Python-based Web Application Development	Purpose: Formation of students' knowledge, skills, develop and adapt websites and web applications using the Python programming language in the Django framework (Python 3rd level) **Contents:** Basic concepts of Django. Data output. Connections. Data input. static files. Basic Django tools. Advanced tools and additional libraries. Setting up and administering a Django site. Views based on classes. Authorization, authentication, registration. How sessions and cookies work. Access rights. Decorators. Accessing session and cookie with request						v								
		AD	EC	Industrial practiceI	**Purpose:** Consolidation of theoretical knowledge on the technical means used in information systems **Content:** The use of the basic laws and provisions of theoretical knowledge on network technologies, operating systems, IT infrastructure of the organization and the acquisition of practical skills in analyzing and building computer system architectures when performing an individual task. Development of options for setting up operating systems. Consolidation of skills in the design and protection of the report.	4							v			v				
10	Mathematical support of	BD	EC	Finite Structures and Information	**Purpose:** the acquisition by students of fundamental theoretical and practical knowledge in the process of	5		v			v				v				

	intellectual information			Coding	studying the basics of discrete mathematics and mathematical logic and equipping students with modern mathematical apparatus. **Contents:** Basic laws and provisions of finite mathematics and coding theory: combinatorial analysis, finite groups, finite graphs, mathematical models of discrete information converters, such as finite automata, Turing machines, algorithm theory. Their application in solving applied problems														
		BD	EC	Mathematical logic	**Purpose:** Acquisition of knowledge on the basics of mathematical logic and equipping students with modern mathematical apparatus **Contents:** Basic laws and provisions of mathematical logic: set theory; boolean algebra; general theory of formal calculus of set-theoretic logic of predicates; application of the studied mathematical apparatus in solving typical problems; to solve problems from related fields of science and its applications; to the study of concepts and theories of modern mathematical logic to the assessment of the degree of adequacy of the proposed apparatus for solving problems.	4		v			v				v				
		BD	EC	Processing of fuzzy knowledge and fuzzy inference	**Purpose:** Formation of knowledge and skills in applying the theory of fuzzy sets in the problems of designing information systems and artificial intelligence **Contents:** Additional chapters of algebra and logic: groups, rings, fields. Linear and affine spaces. Algebraic systems and their models. The theory of models. Set theory. Axiomatization of set theory. Applications to the design of information systems. Pattern recognition. Decision making in artificial intelligence systems. Models of logical inference.	5		v			v				v				
		BD	EC	Fundamentals of fuzzy set theory	**Purpose:** Formation of basic knowledge in mathematical logic for the application of the theory of fuzzy sets **Contents:** Calculations in abstract algebraic systems. Methods for constructing formal theories and their models in algebraic systems. Axiomatics and basic theorems of set theory. Construction of formal conclusions within the framework of logical calculus. Construction of formal			v		v	v				v				

					proofs. Building a knowledge model using fuzzy set theory. Evaluation of the reliability of the conclusions obtained from the results of experimental studies. Principles of constructing logical inferences in non-classical logics.														
		BD	EC	Foundations of Computational Linguistics	**Goal:** Formation of knowledge of the basics of computational linguistics and skills of orientation in the problems of computational linguistics **Contents:** Directions of computational linguistics. Toolkit: hypertext technologies for text representation. The concept of hypertext. Computational lithography: computer complex language guide and its properties and areas of its application. Main problems of machine translation. Modern machine translation systems. Areas of use of machine translation. Automated learning systems. Main components and functions of computer training systems. Basic concepts of corpus linguistics.	5		v		v	v				v				
		BD	EC	Mathematical modeling of the description of natural languages	**Purpose:** Formation of knowledge and basic skills in mathematical modeling of natural language description **Contents:** Natural and artificial languages. Computer support for knowledge representation. Automated analysis: recognition and synthesis of oral and written speech. Linguistic databases: models and data types. Methods of computational linguistics in relation to the processing of texts in natural language. Determination of various probabilistic characteristics of texts in natural language. Methods for analyzing texts in natural language.	5		v		v	v				v				
		AD	KQ	Technologies for the development of digital twins	**Purpose:** Formation of knowledge and basic skills in the development of digital twins **Contents:** Basic concepts and definitions of the classification of the digital twin (CD). The market for digital twins. Examples of the use of digital twins in various industries. Engineering tools for creating a CD. CD and product optimization. Technologies for collecting and processing data for creating a CD. Technologies of mathematical modeling and digital shadows. Application in CD: clouds; peripheral computing; new human-machine interfaces. CD and blockchain technologies.	5				v	v								

		PD	EC	Development of Applications and Web Services in C#	**Purpose:** Formation of in-depth knowledge of programming in the C # environment. Gaining practical skills in developing Web services in C# (3rd level C#) **Contents:** An overview of how to develop applications using C#. Designing an ASP, NETMVC Web application. Working with MVC Create models, views, and controllers. Creating navigation controls. Applying CSS styles. Authentication and authorization. Working with the state of a Web application. Introduction to WindowsAzure. Working with cloud services. Request processing in ASP, NETMVC. Using WebSockets/ Deploying ASP,NETMVC applications.						v							
11	Information support of systems	PD	UC	Database management systems	**Purpose:** Formation of knowledge about the organization and functioning of the database and skills to work with the database **Contents:** Basic concepts, database organization, data models; functions of the database management system; modern technologies of data storage, data retrieval, query languages; technologies and software for database design; mathematical database model based on Codd algebra; Descriptions of basic operations in the language of relational algebra. Development of the client and server parts of distributed databases using modern DBMS.	5			v					v		v			
		PD	EC	Databases in information systems	**Purpose:** Formation of knowledge about the DBMS and skills to work with it **Contents:** Design, installation and configuration of software; ensuring the functioning of the database. Coordination of database access control: coordination of ensuring user access rights to the database; coordination of software settings to support the work of users with the database. Event monitoring and database backup and recovery management: regulation of backup activities; monitoring compliance with the regulations for backup and recovery of the database; data loss and corruption prevention management.	4			v					v		v			

		PD	EC	Programming in JavaScript Environment	**Purpose:** Formation of skills in using the JavaScript language for use in WWW applications (JavaScript level 3) **Contents:** Introduction to JavaScript. Functional programming in JavaScript. Object-Oriented Programming in JavaScript. Built-in JavaScript objects. Strings in JavaScript. Working with the browser and BOM. Working with the DOM Events in JavaScript. Working with forms in JavaScript Storing data in web applications. JSON. Collections and iterators. AJAX technology. Introduction to jQuery						v								
		AD	EC	Industrial practice II	**Purpose:** Consolidation of theoretical knowledge on information support of systems **Contents:** Use of the basic laws and provisions of theoretical knowledge on information support of IP with the help of database management systems. In-depth practical skills in the analysis of information flows of the subject area and the development of typical information objects and gaining experience in working in a team. Application of the method of analysis of the object of practice for structuring data when performing an individual task; Skills in the correct preparation and protection of the report	6	v		v					v		v			
1 2	Fundamentals of Internet technologies	PD	UC	Web Services Development (Java EE)	**Purpose:**Formation of knowledge on modern methods of programming WWW-applications on the Java EE platform. **Contents:** Introduction to WEB-programming. Fundamentals of server technologies. Server programming languages and development environments. Development of applications based on the database. Client technologies of WEB-programming: HTML, JavaScript, CSS. Modern WWW-application model. CMS control systems. WEB services. Cloud technologies. A review of modern methods of SEO (search engine optimization) to improve the promotion of developed Web sites and Web applications on the Internet.	6					v			v					

		PD	EC	Tasks and methods of machine learning	**Purpose:** Mastering machine learning algorithms; basic data technologies **Content:** Application of machine learning in intelligent systems. Data processing - data collection and analysis methods, parsing; building dashboards, visualization. Model Building, Model Accuracy Estimation: Basic Machine Learning Algorithms. Computer vision: image processing; neural networks in machine learning. Natural language processing: syntactic and morphological analysis; neural networks for natural language processing.	5				v	v								
		PD	EC	Digital Twin Development Technologies	**Purpose:** Formation of knowledge and basic skills in the development of digital twins **Contents:** Basic concepts and definitions of the classification of the digital twin (CD). The market for digital twins. Examples of the use of digital twins in various industries. Engineering tools for creating a CD. CD and product optimization. Technologies for collecting and processing data for creating a CD. Technologies of mathematical modeling and digital shadows. Application in CD: clouds; peripheral computing; new human-machine interfaces. CD and blockchain technologies.						v								
		PD	EC	Programming Web Application	**Purpose:** Teaching programming of WEB-applications **Contents:** Basic laws and provisions of programming WEB-applications: technical specifications, standards, protocols used on the Internet. Design architecture, development tools and technologies, web application client scenarios. JavaScript language. CGI technology. Development of server applications using PHP scripts as an example. XML language. Web services. Building architecture, security of building Web applications based on CMS, Web 2.0, semantic and social Web. Web login processing within the DMP system	6					v			v					
		PD	EC	Mobile App Development iOS, Android	**Purpose:** Formation of sustainable skills in software development for mobile gadgets on Android and iOS platforms. **Contents:** An overview for mobile devices and development tools for various platforms. Configurations and profiles in JavaME. Android programming. Java Virtual Machine in Android. AndroidSDK and third-party						v								

					development; installing tools, compiling and installing Android applications. First iOS app. inite. iTahDoodle project. Execution in iOSSimulator.														
13	Development of intelligent information systems	PD	EC	BigData technologies	**Purpose:** Formation of knowledge and skills for working with big data **Contents:** Basic laws and regulations for working with BigData technologies: technologies for processing and working with Big Data (OLAP); Big Data and Data Mining big data infrastructure; distributed computing and the Hadoop ecosystem; MapReduce approach and its software implementations; parallel computing; application of cloud technologies; machine learning; data analysis using machine learning on the Microsoft Azure platform	5		v										v	
		PD	EC	Expert assessment methods	**Purpose:** Formation of a systematic view of the decision-making process based on expert assessment methods **Contents:** Purpose, basic properties, principles of building expert systems. ES development technology. Mathematical methods of expert evaluation: formalization of information and scale. Methods: direct evaluation; consecutive comparisons; processing of expert assessments; assessing the competence and consistency of the expert group; multi-criteria expert evaluation. Uncertainties in ES and emerging problems: the theory of subjective probabilities; Bayesian estimation.										v				
		PD	EC	Tasks and methods of pattern recognition	**Purpose:** To give an overview of the available methods and ways of pattern recognition, to determine the scope of application. To instill practical skills in applying methods to real problems **Contents:** Fundamentals of pattern and image recognition. Main areas of application. Classifiers: linear and non-linear. Bayesian decision theory. Methods for solving the recognition problem: committee; feature selection; feature generation. Neural network pattern recognition. Hopfield, Hamming, Kohonen networks. Grossberg classifier. Networks based on radial basis functions.	5				v	v								
		PD	EC	Pattern recognition and	**Purpose:** Formation of knowledge on the methodology for developing algorithms for image recognition and					v	v								

				image processing	processing **Contents:** Basic laws and provisions of the theory of pattern recognition: conceptual foundations of approaches and methods of pattern recognition; algorithms used in the analysis of images, acoustic signal or other types of sensors; linguistic analysis or machine learning; ways of digital representation of images. Development of skills in applying the methods of spatial and spectral image processing; mathematical models used to evaluate image quality.														
		PD	EC	Special Practicum in 1C Environment	**Purpose:** Teaching skills to work in the 1C:Enterprise environment **Contents:** Skills of working in the 1C:Enterprise environment. Maintaining records and records. Setting up a chart of accounts. Ways to enter information: postings, documents. Accounting and reporting in 1C:Enterprise. Typical documents: receipt and expenditure cash warrant, payment orders, invoice, waybills, invoice. Application of the 1C:Enterprise complex to automate production tasks	5											v		
		PD	EC	Technologies M2M (internet of things)	**Purpose:** Mastering the basic skills of programming end devices; basic skills in creating a software solution for processing and storing data using cloud technologies. **Contents:** Introduction to the Internet of Things. Hardware: end devices; examples and applications of controllers, sensors and actuators; Arduino and Raspberry Pi lines. Network technologies and the Internet of things. Data processing. Application of cloud technologies and service-oriented architectures on the Internet of Things.	5										v			
		PD	EC	Information systems design	**Purpose:** Teaching the skills of designing all types of information systems support **Contents:** Basic principles of IS design: the basics of the creation and operation of IS, classification and consumer properties, new approaches in design technology, new tools, CASE - technologies, hardware implementation of DBMS functions, design of all types of software, databases, work in multi-user mode; protection of information in the LAN.	5		v	v		v	v							
		PD	EC	System	**Purpose:** Teaching the skills of designing all types of			v	v		v	v							

				analysis and development	information systems support and analyzing the results **Contents:** Development and description of business processes; principles of building business processes and work algorithms; methods of statistical and mathematical data analysis; requirements for the preparation of regulatory documents; data analysis tools, conflict management techniques. Development of skills and abilities: development of demonstration materials necessary for presentations; drawing up a statistical report on the client base; choosing a method for monitoring, evaluating and adjusting the work of the database														
14	Module for acquiring new professional competencies	DB	KQ	Disciplines for additional educational program	**Purpose:** Formation of theoretical knowledge and practical skills for solving problems in a set of disciplines to obtain additional competencies in a chosen area that is not a core one. **Content:** An additional educational program (Minor), which defines a set of disciplines and (or) modules and other types of educational work determined by the student in order to form additional competencies in a selected area that is not a core one; individualization of students' education, increasing students' motivation.	12		v			v								
15	Final assessment module	AD	EC	Undergraduate or industrial practice	**Purpose:** Application of theoretical knowledge on IS design; calculation of the economic efficiency of IP; ecology and basics of life safety; foundations of entrepreneurial skills and anti-corruption culture **Contents:** Methodology for surveying an object and collecting the necessary materials for the development of an information system; development of the IS model and components; Database; writing the code of the program with the compilation of a test case; program performance check; formulation of conclusions and recommendations	10		v	v		v	v	v	v					
				Writing and defending a thesis, graduation project or preparing and passing a	**Purpose:** Writing and defense of the thesis. **Content:** Confirm professional potential, demonstrate abilities in organizing and conducting independent research in the field of ICT; reasoned development of sound recommendations; disclosure of the level of qualification, theoretical knowledge and practical skills; demonstration of the internal unity of work and display of	8		v	v		v	v	v	v					

				comprehensive exam	the progress and results of the development of the chosen topic; application of the rules for the design and defense of the thesis; determination of preparedness for independent work on the profile.														
	Total					240													

5 SUMMARY TABLE REFLECTING THE VOLUME OF LOANS DISBURSED IN THE CONTEXT OF EP MODULES

Course of study	Semester	Number of modules	Number of subjects s			Credit amount KZ					Total hours	Total credits KZ	Amount	
			RC	SC	KQ	Theoretical education	Physical education	Educational practice	Educational practice	Final certification			exam	pass-fail grade
1	1	3	5	1	1	28	2				900	30	6	1
	2	4	3	3	1	27	2	1			900	30	5	3
2	3	4	2	3	3	28	2				900	30	6	2
	4	7	3	1	2	24	2		4		900	30	5	2
3	5	5		1	6	30					900	30	6	-
	6	4			4	24			6		900	30	3	1
4	7	2		1	4	21					630	21	4	-
	8	3			4	21					630	21	4	-
	9	1				-			10	8	540	18	-	1
total		15	8	10	23	203	8	1	20	8	7200	240	39	10

6 STRATEGIES AND METHODS OF EDUCATION, CONTROL AND EVALUATION

Education strategies	**Student-centered education**: the student is the center of teaching/learning and an active participant in the learning and decision–making process.. **Practice-centered education**: oriented at practical skills development.
Education methods	Conducting lectures, seminars, practical and laboratory work with: ● the use of innovative technologies: • problem-based learning; • case study; • group work; • discussions and dialogues, intellectual games, olympiads, quizzes; • software development; • presentations; ● rational and creative use of information sources: • multimedia training programs; • electronic textbooks; • virtual laboratory work; • digital resources. Organization of independent work of students, individual consultations.
Monitoring and evaluation of the achievability of learning outcomes	Current control on each topic of the discipline, control of knowledge in classroom and extracurricular classes *(according to syllabus)*. Assessment forms: • surveys; • testing on the topics of the discipline; • test; • protection of individual works; • discussions; • trainings; • colloquiums; • essays etc. **Midterm control** at least twice during one academic period within the framework of one academic discipline. **Midterm attestation** is carried out in accordance with the working curriculum, academic calendar. Forms of holding:: ● testing form exam; ● oral exam; ● written exam; ● combined exam; ● project protection; ● practice report protection. **Final state certification.**

7 EDUCATIONAL RESOURCES AND SUPPORT FOR THE EDUCATIONAL PROGRAM

Information Resource Center	The structure of the EIC has 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The basis of the network infrastructure of the EIC consists of 180 computers with Internet access, 110 automated workstations, 6 interactive whiteboards, 2 video doubles, 1 videoconferencing system, 3 scanners of A-4 format, 3. The software of the EIC – AIBS "IRBIS-64" for MSWindows (a basic set of 6 modules), an autonomous server for uninterrupted operation in the IRBIS system. The library fund is reflected in the electronic catalog available to users on the website http://lib.ukgu.kz is on-line 24 hours 7 days a week. Thematic databases of its own generation have been created: "Almamater", "Works of scientists of SKSU", "Electronic Archive".Online access from any device 24/7 via an external link: http://articles.ukgu.kz/ru/pps. Working with catalogs in electronic form. The EC consists of 9 databases: "Books", "Articles", "Periodicals", "Works of the teaching staff of SKSU", "Rare books", "Electronic Fund", "SKSU in print", "Readers" of "SKU". The EIC provides its users with 3 options for accessing its own electronic information resources: from the Electronic Catalog terminals in the catalog hall and divisions of the EIC; through the university's information network for faculties and departments; remotely on the library's website http://lib.ukgu.kz /. Access to international and republican resources is open: "SpringerLink", "Envoy", "Web of Science", "EVSSO", "Epigraph", to electronic versions of scientific journals in open access, "Zan", "RMEB", "Adebiet", Digital library "Akpigress", "Smart-kitar", "Kitar.kz", etc. For people with special needs and disabilities, the library's website has been adapted to the work of visually impaired users in the EIC
Material and technical base	**Specialized audiences:** Computer classes and lecture halls equipped with modern functional and presentation equipment. Modern hardware and licensed software are installed in computer classrooms. All laboratory rooms are equipped with a new generation of computers, which are in working condition, allow for scientific and laboratory work, and are used in full. The computers are connected to a local network and connected to the high-speed network of the university. Lecture halls are equipped with computers and multimedia projectors, which allows teaching at a high level. **Laboratory devices and installations** Standard kit - "Molecular Physics" (Processing of the results of multiple direct measurements, Maxwell's Pendulum) -Installation "Electricity and Magnetism" (Modeling, Determination of the specific charge of an Electron by the magnetron method, Hall Effect)

	Standard kit -"Optics" (Dispersion, Diffraction, Polarization, Interference) - Installation for the study of electrics.hole transition - - Installation for studying the external photo effect - Installation for determining the resonant potential of an inert gas atom (mercury) with an oscilloscope - - Installation for determining the width of the locking layer of the P-n junction and the impurity concentration in the avalanche breakdown area - Instruments and equipment

APPROVAL SHEET

according to the Educational program
6B06121 «Technologies of artificial intelligence»

Director DAA: _____ Naukenova A.S.

Director DAaSA: _____ Nazarbek U.B.

Director DPaC: _____ Bazhirov T.S.

Annex 1

REVIEW
for an educational program
6B06121 «Technologies of artificial intelligence»
(cipher and name)
developed in NJSC «Auezov SKU», Shymkent

1. Brief description of the company and the profile of its activities

The implementation of the proposed EP will be carried out on the basis of the Higher School of "Information Technologies and Energy" of the NJSC Auezov SKU. The University is a leading multidisciplinary university of the Turkestan region. The graduating department "Information Systems and Modeling" has been identified as responsible for the implementation of the educational program.

2. Relevance and relevance of EP

Educational program *6B06121* «Technologies of artificial intelligence» developed in accordance with the needs of the regional labor market in personnel with higher professional education. In the context of the formation and development of professionally oriented education, the problem of training highly qualified personnel for the implementation of managerial and analytical functions in the field of application of ICT technologies becomes urgent. Currently, the number of business facilities, medical, educational and government, research organizations in need of the development, implementation and maintenance of intelligent information systems is increasing in the information space of the region. This circumstance imposes certain obligations on higher education institutions in terms of personnel training.

3. Learning outcomes and competencies, their relationship to the demands of the labor market

The results of training and competencies offered in the EP fully comply with the modern qualification requirements for specialized bachelor's degree specialists, and also contribute to the formation of holistic theoretical knowledge, practical skills and professional skills.

4. Availability of components that develop practical skills

The educational disciplines of the EP provide the formation of the necessary practical skills of a specialist with fundamental and applied knowledge in the field of artificial intelligence technology development.

All internship programs are designed taking into account the requirements of the professional standard, as well as taking into account the opinion of employers. The types of practices included in the updated educational program are determined in accordance with the types of activities that the educational program is focused on. Their content, goals and objectives indicate the orientation of the updated educational program to the development of practical skills and abilities of students.

5. The content of the educational program (modules, disciplines)

The modules "Module of socio-ethnic development", "Mathematical and natural science foundations", introduced disciplines that contribute to the formation of the competence of a modern specialist in the fields of information systems application. The disciplines of the curriculum according to the reviewed updated OP form the entire necessary list of general cultural, general professional and professional competencies.

One of the advantages is taking into account the requirements of employers in the formation of profile disciplines, which in their content make it possible to ensure the competence of the graduate. The quality of the content component of the curriculum is beyond doubt.

All types of educational activities are provided for the preparation of highly qualified specialists with the skills of research work - theoretical training, industrial practice, registration and defense of theses.

The distribution of disciplines by academic periods is rationally and logically justified. The planned volume and time resource for academic disciplines and types of training meet the qualification requirements for the level of graduates.

In accordance with the credit technology of education, the curriculum includes: compulsory academic disciplines, disciplines of the university component and the elective component.

The structure of the educational program as a whole is logical and consistent. Evaluation of the section of academic disciplines allows us to conclude about their high quality and a sufficient level of methodological support. The content of the disciplines corresponds to the competence of the graduate model.

6. The quality of the modular directory

The content of the modular reference book of the educational program corresponds to the accepted competence of the graduate model. The composition of educational modules covers all relevant areas of training of specialists in the field of artificial intelligence technologies.

7. Conclusion on the EP

Based on the above, I consider it possible to assert that the goals and content of the presented educational program meet the modern qualification requirements for bachelor's degree programs specializing in artificial intelligence technologies.

Director of «Innova Corporation Company» LLP Turdaliev Zh.K.

Annex 2

Expert opinion
on the educational program

***6B06121** «Technologies of artificial intelligence»*

1. The relevance of the new EP

The relevance of this educational program is that the development, maintenance and operation of intelligent information systems is widely used in modern life and has many areas of application.

The rapid development of interactive multimedia technologies requires the emergence of specialists of a new formation. There is a significant shortage of specialists in Kazakhstan who are able to create and successfully operate modern ICTs in the field of artificial intelligence technologies. Due to the dynamic development of the industry and the rapid obsolescence of information technologies, constant updating and improvement of educational programs in this area is required.

The development of the sphere of information and telecommunication technologies largely depends on the choice of the concept of training specialists of higher professional education.

2. Compliance of the EP with the formulated goals consistent with the mission of the university, the requests of employers and students

In the educational program ***6B06121 «Technologies of artificial intelligence»*** formulated: the concept of the educational program, the goals and objectives of training specialists, requirements for the organization of the educational process and for applicants, the results of training in a new OP, and also contains a description of the qualification characteristics of the graduate of the educational program, his key and professional competencies, information about disciplines. The list of academic disciplines and their content meet the modern qualification requirements for specialists in the field of "Artificial Intelligence Technologies".

The selection of academic disciplines, the requirements laid down for the knowledge, practical skills and professional competencies being formed are fully consistent with the mission of the university *"We are aimed at generating new competencies, training a leader who translates research and entrepreneurial thinking and culture."*

3. Compliance with the National Qualification Framework of the Republic of Kazakhstan

The objectives and content of the EP correspond to level 6 of the National Qualification Framework of the Republic of Kazakhstan.

4. Reflection in the EP of learning outcomes and competencies based on Dublin descriptors embedded in professional standards/industry frameworks

The educational program is coordinated with the Dublin Descriptors, the 2nd cycle of the Qualification Framework of the European Higher Education Area (A Frame work for Qualifications of the European Higher Education Area), the 6th level of the European Qualification Framework for Lifelong Learning (The European Qualifications Framework for Lifelong Learning).

5. Compliance with the classifier of training areas with higher education

The structure and content of the EP meet the requirements of the classifier of training areas with higher education of the educational program *6B06121 «Technologies of artificial intelligence»*.

6. The structure and content of the EP, the application of the modular principle of their construction

The curriculum includes disciplines of the university component and disciplines of the elective component.

The disciplines of the university component ensure the formation of general and professional competencies.

The disciplines of the elective component expand and deepen the training of students, contribute to obtaining additional competencies, knowledge and skills necessary to ensure the competitiveness of the graduate to the requirements of the labor market.

The modular construction of the educational program allows you to obtain integrated knowledge in modules containing interrelated disciplines. The modular approach is designed to ensure the gradual development of the educational program.

The composition of the educational modules covers all relevant areas of training of highly qualified specialists in the application of artificial intelligence technologies that are competitive in the domestic and international labor markets.

7. The presence of components in the EP for training for professional activity, developing key competencies, intellectual and academic skills, reflecting the changing requirements of society, including the implementation of the presidential program for mastering three languages: Kazakh, Russian and English

The program examines aspects of artificial intelligence technologies, their maintenance and operation of software; development of technical documentation. The new OP submitted for consideration is executed qualitatively, competently. It is important to focus on the unity of theory and practice, focus on training a competent specialist in the field of development and application of intelligent information systems. The included academic disciplines cover the entire spectrum of topical issues and problems in the profile of training, are fully capable of forming the necessary specialized knowledge, skills and abilities in the field of development and application of artificial intelligence technologies.

8. Logical sequence of disciplines and reflection of basic requirements in curricula and training programs

The educational program is fully provided with educational and methodological documentation and related materials.

9. Reflection in the EP of the system of accounting for the academic load of students and teachers in loans, its compliance with the parameters of the credit system of education.

The content of the EP fully complies with the requirements of the credit technology of education, including in terms of accounting for the academic load of teachers and students in loans. It is planned to study 240 credits.

10. The presence in the programs of industrial practice to consolidate the theoretical material expressed in the academic load in credits

The educational program provides for three types of practices: educational in the amount of 1 credit, industrial practice I in the amount of 4 credits, industrial practice II in the amount of 6 credits and pre-graduate in the amount of 10 credits

11. Information about the teaching staff involved in the implementation of the EP

The EP reflects information about the teaching staff involved in its implementation. The qualification requirements for teaching staff are met.

12. Qualifications obtained as a result of mastering the EP

Upon mastering the OP, it is planned to assign a bachelor's degree in the field of information and communication technologies to the graduate according to the educational program6B06121– «Technologies of artificial intelligence».

13. Recommendations

In accordance with the above, it seems possible to assert that the goals and content of the OP meet the modern qualification requirements for bachelor's degree training specializing in information and communication technologies.

It is recommended to accept the presented educational program for implementation.

Expert Musabekova L.M.
Doctor of Technical Sciences, Professor of the Department
"VT and PO"

	Artificial intelligence specialist	6th-7th levels of ORC

PROFESSION CARD: ARTIFICIAL INTELLIGENCE ENGINEER

Code:	2519-9-001		
Group code:	2519-9		
Profession:	artificial intelligence engineer		
Other possible job titles:	AI programmer		
Qualification level for ORK:	6		
The main purpose of the activity:	Perform work on the design and creation (modification) of artificial intelligence systems		
Labor functions:	Mandatory labor functions	1. Implementation of artificial intelligence systems	
		2. Trial operation of artificial intelligence systems and its implementation	
	Additional labor functions	-	
Labor function 1: Implementation of artificial intelligence systems	**Task 1:** Analysis of the subject and problem area	**Skills:**	
		1. Form customer requirements for artificial intelligence systems 2. Perform problem identification i.e. determine: required resources (time, people, equipment, etc.); sources of knowledge (books, orders, GOSTs, experts, etc.); existing similar intelligent systems; goals (training, management, diagnostics, etc.); classes of tasks to be solved, etc. 3. Develop optimal solutions to customer requirements at the level of the concept of the system being created (structure, functions, software and hardware platform, modes) 4. Develop alternative options for the system concept, analyze them and select the best concept 5. Evaluate and justify recommended solutions 6. Analyze business requirements	
		Knowledge:	
		1. Tools and methods for identifying requirements 2. Technologies of interpersonal and group communication in business interaction, the basics of conflictology. 3. Design and functioning of modern intelligent systems 4. Business Correspondence Rules	
	Task 2: Development of an intelligent system project	**Skills:**	
		1. Develop, coordinate and approve the terms of reference for the creation of artificial intelligence systems 2. Carry out knowledge extraction (i.e. obtaining by the knowledge engineer the most complete possible representation of the subject area and the ways of making decisions in it). 3. Develop documentation for the artificial intelligence system and its parts. 4. Prepare analytical reports	
		Knowledge:	
		1. Design and functioning of modern artificial intelligence systems 2. Theoretical foundations for designing artificial intelligence systems 3. Modeling fuzzy sets, fuzzy logic	
	Task 3: Software implementation of an intelligent system	**Skills:**	
		1. Use the selected programming environment and tools of the database and knowledge management system. 2. Leverage existing technical and/or software architecture	
		Knowledge:	
		1. Traditional programming languages (C++, Java, Python, etc.) 2. Special programming languages focused on the processing of symbolic information (LISP, SMALLTALK, REFAL) 3. Logic programming languages (Prolog) 4. Knowledge Representation Languages (OPS 5, KRL, FRL) 5. Integrated software environments (KE, ARTS, GURU, G2) 6. Shells of intelligent and expert systems (BUILD, EMYCIN, EXSYS Professional, EXPERT), which allow you to create applied intelligent systems without resorting to programming 7. Software Development Methodologies	
Labor function 2: Pilot operation of artificial intelligence systems and its implementation	**Task 1:** Testing of artificial intelligence systems	**Skills:**	
		1. Testing the usability and adequacy of I/O interfaces 2. Check the effectiveness of the control strategy (enumeration order, use of fuzzy inference, etc.) 3. Conduct quality checks on test cases 4. Check the correctness of the knowledge base (completeness and consistency of the rules)	
		Knowledge:	
		1. Methods for automatic and automated software health checks 2. The main types of diagnostic data and ways to present them 3. Methods for creating and documenting test cases and test datasets 4. Rules, algorithms and technologies for creating test data sets 5. Requirements for the structure and storage formats of test data sets	
	Task 2: Implementation and maintenance of artificial intelligence systems	**Skills:**	
		1. Prepare the automation object for the introduction of artificial intelligence systems into action 2. Conduct staff training to work with the artificial intelligence system 3. Test artificial intelligence systems 4. Conduct user consultations on the implemented artificial intelligence system 5. Eliminate found flaws and errors 6. Correct and supplement knowledge bases	
		Knowledge:	

		1. The main tools of artificial intelligence 2. The main areas of application of artificial intelligence systems 3. Test Methods for Artificial Intelligence Systems 4. Database Basics	
Requirements for personal competencies	Analytical thinking, Critical analysis, Responsibility Organization, ability to solve non-standard tasks		
Relationship with other professions within the OQF	6	Artificial intelligence specialist	
	7	Artificial intelligence specialist	
Link to ETKS or KS or other job directories	KS	140. Software engineer (programmer)	
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT

PROFESSION CARD: APP PROGRAMMER

Code:	2519-9-002		
Group code:	2519-9		
Profession:	Application programmer		
Other possible job titles:	Programmer-developer		
Qualification level for ORK:	6		
The main purpose of the activity:	Develop a technical design of artificial project systems and its software implementation.		
Labor functions:	Mandatory job functions:	1. Development and software implementation of an artificial intelligence system	
		2. Design of artificial intelligence systems	
	Additional labor functions:	-	
Labor function 1: Development and software implementation of an artificial intelligence system	**Task 1:** Development of data structures	**Skills:**	
		1. Identify the basic concepts of the subject area and their characteristics. 2. Define terminology and relationships between concepts. 3. Determine the structure of input and output information 4. Define decision strategy 5. Conduct knowledge structuring (develop informal descriptions of knowledge about the subject area in the form of a graph, table, diagram or text, which reflects the basic concepts and relationships between the concepts of the subject area). 6. Migrate existing data	
		Knowledge:	
		1. Modern problems of artificial intelligence and design of applied intelligent systems. 2. The main tools of artificial intelligence. 3. Modeling of fuzzy sets, fuzzy logic.	
	Task 2: Development of data processing algorithms	**Skills:**	
		1. Develop generalized and detailed algorithms that implement a mathematical model on the developed data structures 2. Use methods and techniques of algorithmization of tasks 3. Use software products for graphical display of algorithms. 4. Apply standard algorithms in relevant areas 5. Fundamentals of higher mathematics in the scope of the program of a technical university.	
		Knowledge:	
		1. Methods and techniques for formalizing tasks. 2. Functional specification formalization languages 3. Methods and techniques of algorithmization of tasks 4. Notations and software products for graphic display of algorithms 5. Algorithms for solving typical problems, areas and methods of their application	
Labor function 2: Design of artificial intelligence systems	**Task 1:** Analysis and formalization of requirements for artificial intelligence systems	**Skills:**	
		1. Analyze the fulfillment of requirements. 2. Develop implementation options. 3. Apply methods and techniques for formalizing tasks 4. Communicate with stakeholders	
		Knowledge:	
		1. Architecture, device and functioning of computing systems. 2. Fundamentals of modern database management systems. 3. Database theory. 4. Database storage and analysis systems. 5. Modern principles of building user interfaces	
	Task 2: Development of technical specifications for artificial intelligence systems	**Skills:**	
		1. Choose means of implementing the requirements for artificial intelligence systems. 2. Develop options for the implementation of artificial intelligence systems. 3. Communicate with stakeholders	
		Knowledge:	
		1. Languages of formalization of functional specifications. 2. Methods and techniques for formalizing tasks. 3. Methods and tools for designing artificial intelligence systems. 4. Methods and tools for designing interfaces.	

		5. Methods and means of designing databases. 6. Architecture, device and functioning of computing systems.
	Task 3: Development of a technical project for artificial intelligence systems	**Skills:** 1. Use existing standard solutions and templates of artificial intelligence systems 2. Apply methods and tools for designing artificial intelligence systems, data structures, databases, software interfaces 3. Communicate with stakeholders **Knowledge:** 1. Principles of building the architecture of artificial intelligence systems 2. Typical solutions, libraries of program modules, templates, object classes used in the development of artificial intelligence systems 3. Methods and tools for designing artificial intelligence systems 4. Database Design Methods and Tools 5. Methods and tools for designing software interfaces

Requirements for personal competencies	Organization, Initiative, Attentiveness, Responsibility Discipline, diligence, flexibility of thinking High learning ability, Systems thinking, Ability to solve non-standard problems		
Relationship with other professions within the OQF	6	artificial intelligence engineer	
	7	artificial intelligence engineer	
Link to ETKS or KS or other job directories	KS	185. Programming Technician 140. Software engineer (programmer)	
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT

3.Professional standard technical data

Designed by:	Limited Liability Partnership “System Research Company “Factor” Project leader: Gabbasov M.B. Contact details of the head: Mars0@mail.ru +7 701 908 25 11 Project executors and contact details of executors: Abdeshov H.U. habdeshov@rambler.ru +7 777 2505831 Uvaleev Zh.E. zh_uali@mail.ru 87015228028Baideldinov M.U. Make3508@gmail.com +77013918037 Approved by the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 259 dated December 24, 2019
The expertise is provided by:	Organization: LLP "Tamur" Experts and contact details of experts: General Director Berentaev B. 870171476511
Version number and year of release:	Version 1, 2019
Updated:	ALE "International Association for Certification and Development of Information Technologies Master-It" Chairman: Omarov Zh.B. Artists: Kaisenov K.K. master_it_rk@mail.ru +7 701 2140195 Danilov M.S. marymasterit@mail.ru +7 777 8151000 College of Kazakhstan Engineering and Technology University Shalabaeva M.Kh. m.shalabaeva@mai.ru +7 701 4735134 Kazakhstan Reading Association Zeynegul K. Zikonti24@gmail.com +7 701 1913948 "Orleu" biliktilikti arttyru ulttyk ortalygy" Mukhamedzhanova S.T. orleualmaty@inbox.ru +7 778 2007402 IT school of service LLP "SDM-Services" Rybalko L.V. sdm.k@bk.ru +7 705 2090213 Global Education Group Inc. Ltd (London) Nurzhanova H. eva.global.london@bk.ru +7 701 1119480 Agency of IT products PR-KZ-MEDIA LLP Zhrebtsov S.V.

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Expertise provided by:	ALE "International Association for Certification and Development of Information Technologies Master-It" Chairman: Omarov Zh.B. master_it_rk@mail.ru +7 777 8151000
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Date of indicative revision:	12/30/2025

Appendix No. 36
to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs
Republic of Kazakhstan "Atameken"
dated December 24, 2019 No. 259

professional standard
"Testing Web and multimedia applications"

Glossary

The following terms and definitions apply in this professional standard:

Information system (IS)- an organizationally ordered set of information and communication technologies, service personnel and technical documentation that implement certain technological actions through information interaction and are designed to solve specific functional problems.

Information technology (IT, IT)is a process that uses a set of means and methods for collecting, processing and transmitting data to obtain information of a new quality about the state of an object, process or phenomenon. Information technology (IT, from the English. Information technology, IT) is a class of areas of activity related to technologies for managing and processing a huge flow of information using computer technology.

IS maintenance- ensuring the use of the IS put into commercial operation in accordance with its purpose, including measures to correct, modify and eliminate software defects, without upgrading and implementing additional functional requirements and subject to maintaining its integrity.

Information system architecture- a concept that defines the model, structure, functions performed and the relationship of the components of the information system.

Database (DB)- a set of data organized according to a conceptual structure that describes the characteristics of this data, as well as the relationships between their objects.

Software -a set of programs, program codes, as well as software products with technical documentation necessary for their operation.

Software interface -a system of unified links intended for the exchange of information between the components of a computing system, specifying a set of necessary procedures, their parameters and methods of handling.

Software -an independent program or part of software that is a product, which, regardless of its developers, can be used for the intended purposes in accordance with the system requirements established by the technical documentation.

Redesign– modification of the graphic and / or structural and functional components of an existing site or software product

Graphical user interface(GUI), graphical user interface (GUI) - a type of user interface in which the interface elements (menus, buttons, icons, lists, etc.) presented to the user on the display are executed in the form of graphic images.

web-page (eng. Web page) - a document or information resource of the World Wide Web, which is accessed using a web browser. A typical web page is an HTML text file

Web resourceis a page or set of pages hosted on the Internet, which may include both text and graphic information, as well as multimedia components (video, music, etc.).

front-endis the client side of the user interface to the software and hardware part of the service. This type of development includes everything that the user sees when opening a web page.

backend-this is a set of hardware and software tools that implement the logic of the web resource.

Search Engine Optimization(Englishsearch engine optimization, SEO) - a set of measures for internal and external optimization to raise the position of the site inissuance results search enginesaccording to certain user requests, in order to increasenetwork traffic(for web-resources) and potential customers (for commercial resources) and subsequent monetization (revenue generation) of this traffic. SEO can target a variety of search types, including image search, video search, news search, and industry-specific search engines.

Obfuscation(fromlat.obfuscare - obscure, obscure; AndEnglishobfuscate - make non-obvious, confusing, confusing) or code obfuscation - castingsource codeor the executable code of the program to a form that preserves its functionality, but makes it difficult to analyze, understand the operation algorithms and modify whendecompilation. One of the goals of obfuscation is to optimize the program in order to reduce the size of the running code and (if a non-compiled language is used) speed up the work.

ICT– Information and communication technologies;

BY- Software;

ISCED– International Standard Classification of Education

1. Professional Standard Passport

PS name:	Web and multimedia application testing
PS number:	
The names of the section, section, group, class, and subclass according to OKED:	J Information and communication 62 Computer programming, consulting and other related services 62.0 Computer programming, consulting and other related services 62.01 Computer programming activities 62.01.1. Software Development 63.12 Web portals 63.12.0 Web portals
Brief description of the PS:	Creation, modification and maintenance of websites, corporate portals of organizations, multimedia and interactive applications, web resources on the Internet.

2. Occupation cards

List of profession cards	web developer	5th-6th levels of ORC
	Web page developer	5th-6th levels of ORC
	Application developer	5th-6th levels of ORC
	Graphical user interface specialist	5th-6th levels of ORC
	GUI Architecture Specialist	5th-6th levels of ORC
	webmaster	5th-7th levels of ORC

PROFESSION CARD

"WEB-DEVELOPER"

Code:	2512-2-001
Group code:	2512-2
Profession:	web developer
Other possible job titles:	web specialist web programmer Full stack developer
Qualifying	6

ORC level:		
The main purpose of the activity	Design, creation and modification of web resources, integration of web resources with other computer applications.	
Labor functions	Mandatory labor functions	1. Performing work on the creation (modification) of web-resources
		2. Ensuring the safe and uninterrupted operation of the web resource
		3. Development of technical documentation
	Additional labor functions	-
Labor function 1: Performing work on the creation (modification) of web-resources	**Task 1** Design and development of a front-end web resource	**Skills:**
		1. Model domain structures 2. Use existing standard solutions and web resource templates. 3. Apply methods and tools for designing web resources, data structures, databases, programming interfaces 4. Apply methods and tools for assembling software modules and components, developing procedures for software deployment, data migration and transformation, creating programming interfaces 5. Generate reporting documentation based on the results of the work performed.
		Knowledge:
		1. Simulation Technique with Simulators 2. The device and functioning of modern web-resources. 3. Modern principles of building user interfaces 4. Modern methods for testing the ergonomics of user interfaces 5. The main requirements for the design of graphical interfaces, methods of transmitting information in text, graphics, sound, video and other multimedia formats, depending on the user category, taking into account the age and characteristics of disabilities 6. Network protocols and fundamentals of web technologies 7. Modern interpreted programming languages 8. Software life cycle 9. HTML and CSS 10. Features of the chosen programming environment and database management system 11. Software Development Methodologies 12. Methodology of object-oriented programming 13. Principles of constructing the architecture of web resources 14. Typical solutions, libraries of program modules, templates, object classes used in the development of web resources
	Task 2 Design and development of a back-end web resource	**Skills:**
		1. Design software in detail 2. Define relationships between objects. 3. Define processes produced by objects 4. Set process priority 5. Design database models and processes of its interaction with server applications. 6. Code in server-side programming languages (PHP, Ruby, Python, etc.)
		Knowledge:
		1. Software life cycle 2. Typical IS architectures. 3. Database Models 4. Basic knowledge of HTML 5. Web server administration 6. Methods for Designing Processes and Codes 7. Server programming languages (PHP, Ruby, Python, etc.)

		8. Work with web servers 9. SQL - database query language 10. Network protocols and fundamentals of web technologies 11. Understanding how web servers work 12. Understanding the functioning of modern DBMS 13. Components of software and hardware architectures of web resources, existing applications and interfaces for interacting with them 14. Methods and tools for assembling and integrating software modules and components 15. Typical solutions, libraries of program modules, templates, object classes used in the development of web resources
Labor function 2: Ensuring the safe and uninterrupted operation of the web resource	**Task 1** Ensuring the safe and uninterrupted operation of the web resource	**Skills:**
		1. Install and configure information security software 2. Analyze event log messages 3. Develop regulatory documents 4. Identify incidents of violation of safe operation, and decide on changes in procedural procedures 5. Use regulatory and technical documentation in the field of software
		Knowledge:
		1. The essence and concept of information security, the main characteristics of its components 2. Sources of threats to information security and measures to prevent them 3. Modern software and hardware tools and ways to ensure the security of web resources 4. Architecture, device and functioning of computing systems 5. Principles of operation of communication equipment 6. Network protocols and fundamentals of web technologies 7. Fundamentals of modern database management systems 8. The device and functioning of modern web-resources 9. Modern standards of interaction between components of distributed applications 10. Fundamentals of information security of web resources 11. English at the level of reading technical documentation in the field of information and computer technology
	Task 3 Integration testing of a web resource with external services and accounting systems	**Skills:**
		1. Interpret customer business requirements to write test cases 2. Set requirements for test results 3. Work independently with information 4. Work in a team with other testers and developers 5. Develop regulatory documents
		Knowledge:
		1. Subject area of the project for drawing up test plans 2. Change Management Basics 3. Architecture, device and functioning of computing systems 4. Principles of operation of communication equipment 5. Network protocols and fundamentals of web technologies 6. Fundamentals of modern database management systems 7. The device and functioning of modern web-resources 8. Database theory 9. Database storage and analysis systems 10. Basics of programming 11. Modern standards of interaction between components of distributed applications 12. Software tools and platforms for developing web resources 13. Fundamentals of information security of web resources
Labor function 3: Development of technical	**Task 1** Analysis of	**Skills:**
		1. Analyze compliance requirements

documentation	requirements for a web resource and their formalization	2. Develop options for implementing requirements 3. Evaluate and justify recommended solutions 4. Apply methods and techniques for formalizing tasks 5. Use software products for graphical display of algorithms
		Knowledge:
		1. Architecture, device and functioning of computing systems 2. Network protocols and fundamentals of web technologies 3. Fundamentals of modern database management systems 4. The device and functioning of modern information resources 5. Database theory 6. Database storage and analysis systems 7. Modern principles of building user interfaces 8. Modern methods for testing the ergonomics of user interfaces 9. Modern standards of interaction between components of distributed applications 10. Software tools and platforms for developing web resources 11. Methods for describing and modeling processes, process modeling tools 12. Fundamentals of the theory of system analysis and construction of interaction diagrams
	Task 2 Development of technical specifications for a web resource	**Skills:**
		1. Choose the means of implementing the requirements for a web resource 2. Develop options for implementing a web resource 3. Evaluate and justify recommended solutions 4. Communicate with stakeholders 5. Develop and approve technical specifications for a web resource
		Knowledge:
		1. Functional specification formalization languages 2. Methods and techniques for formalizing tasks 3. Methods and tools for designing a web resource. 4. Interface Design Methods and Tools 5. Database Design Methods and Tools 6. Architecture, device and functioning of computing systems 7. Network protocols and fundamentals of web technologies 8. The device and functioning of modern web-resources 9. Modern principles of building user interfaces 10. Modern standards of interaction between components of distributed applications 11. Software tools and platforms for developing web resources 12. Fundamentals of information security of web resources 13. Methods for describing and modeling processes, process modeling tools
Requirements for personal competencies	Analytical thinking, Critical analysis, Responsibility organization	
Relationship with other professions within the OQF	5	webmaster
	6	webmaster
Communication with ETKS or KS	KS	185. Technician - programmer 140. Software engineer (programmer)
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies Qualification: Bachelor in ICT
PROFESSION CARD		

<table>
<tr><td colspan="3">"WEB PAGE DEVELOPER"</td></tr>
<tr><td>Code:</td><td colspan="2">2512-2-002</td></tr>
<tr><td>Group code:</td><td colspan="2">2512-2</td></tr>
<tr><td>Profession:</td><td colspan="2">Web page developer</td></tr>
<tr><td>Other possible job titles:</td><td colspan="2">web designer

Front end developer</td></tr>
<tr><td>Qualification level for ORK:</td><td colspan="2">6</td></tr>
<tr><td>The main purpose of the activity</td><td colspan="2">Design, layout of web pages, content filling, administration and updating of a web resource</td></tr>
<tr><td rowspan="4">Labor functions:</td><td rowspan="3">Mandatory job functions:</td><td>1. Working with requirements for a web resource</td></tr>
<tr><td>2. Web page layout</td></tr>
<tr><td>3. Technical and informational support of the web resource</td></tr>
<tr><td>Additional labor functions:</td><td>-</td></tr>
<tr><td rowspan="4">Labor function 1:

Working with requirements for a web resource</td><td rowspan="4">Task 2:

Determination of the customer's initial requirements for a web resource and the possibility of their implementation</td><td>Skills:</td></tr>
<tr><td>1. Conduct negotiations.
2. Conduct presentations.
3. Prepare event protocols.
4. Translate requirements concepts into content
5. Translating requirements concepts into visual design</td></tr>
<tr><td>Knowledge:</td></tr>
<tr><td>1. Examples of implementation in the subject area of the project.
2. Methods for identifying requirements.
3. Technologies of interpersonal and group communication in business interaction, the basics of conflictology.
4. Technologies for preparing and conducting presentations.
5. Principles of operation of communication equipment
6. Network protocols and fundamentals of web technologies
7. Fundamentals of modern database management systems.
8. The device and functioning of modern web-resources
9. Business Correspondence Rules
10. Legal requirements for web resources
11. Information structure
12. Style sheet languages
13. Knowledge of the principles and processes of providing client and personal services.</td></tr>
<tr><td rowspan="3">Labor function 2:

Web page layout</td><td rowspan="3">Task 1:

Web page optimization</td><td>Skills:</td></tr>
<tr><td>1. Analyze web pages and their components, analyze the stages of loading web pages and analyze the characteristics of browsers with which web pages are usually loaded
2. Minify, obfuscate and compress code (HTML, CSS and JS).
3. Perform image optimization (compression, format)
4. Eliminate redundant code (for optimization purposes)
5. Optimize the number of requests
6. Optimize layout for different browsers
7. Optimize the structure of web pages</td></tr>
<tr><td>Knowledge:</td></tr>
</table>

		1. Optimization Goals 2. web services,allowing you to get a comprehensive assessment of the client performance of the tested site 3. Key Features of Common Browsers 4. Scripting programming languages 5. Markup languages 6. Style sheet languages 7. minimization methods,obfuscationand code compression 8. Image optimization methods 9. Methods for eliminating redundant code 10. Methods for reducing the number of requests 11. Setting up caching 12. Layout optimization methods 13. Features of displaying web pages 14. Web page structure 15. Features of loading external objects by browsers 16. Page loading stages 17. Distributed content storage 18. Compression methods supported by browsers 19. Setting up web servers	
Labor function 3: Technical and informational support of the web resource	**Task 1:** Web resource administration	**Skills:** 1. Define or document backup and recovery plans 2. Identify, standardize and communicate levels of access and security 3. Solve computer software problems 4. Develop specifications or procedures for the development or maintenance of websites 5. Develop test procedures 6. Identify sources of problems with web pages and take action to fix them. **Knowledge:** 1. The essence and concept of information security, the main characteristics of its components 2. Sources of threats to information security and measures to prevent them 3. Modern software and hardware tools and ways to ensure the security of a web resource 4. Architecture, device and functioning of computing systems 5. Principles of operation of communication equipment 6. Network protocols and fundamentals of web technologies 7. Fundamentals of modern database management systems 8. The device and functioning of modern wb-resources 9. Modern standards of interaction between components of distributed applications 10. Fundamentals of information security of web resources 11. English at the level of reading technical documentation in the field of information and computer technology	
Requirements for personal competencies	Organization, Attention, Discipline diligence, high learning ability, teamwork		
Relationship with other professions within the OQF	5	web developer	
	6	web developer	
Communication with ETKS or KS	KS	185. Programming Technician 140. Software engineer (programmer)	
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT

PROFESSION CARD "APP DEVELOPER"		
Code:	2512-2-004	
Group code:	2512-2	
Profession:	Application developer	
Other possible job titles:	Programmer Programmer-developer	
Qualification level for ORK:	6	
The main purpose of the activity	Develop, maintain applications and draw up related technical documentation	
Labor functions:	Mandatory job functions:	1. Integration of software modules and components, and verification of software product releases
		2. Requirements engineering and software design
	Additional labor functions:	-
Labor function 1: Integration of software modules and components, and verification of software product releases	**Task 1:** Development of procedures for integration of software modules	**Skills:**
		1. Write program code for integration procedures for program modules. 2. Use the selected programming environment to develop procedures for integrating software modules. 3. Apply methods and tools for assembling modules and software components, developing procedures for deploying software, migrating and transforming data, and creating programming interfaces.
		Knowledge:
		1. Methods and tools for assembling modules and software components. 2. Interfaces for interaction with the external environment. 3. Interfaces of interaction of internal modules of the system. 4. Methods and tools for developing procedures for software deployment 5. Methods and means of data migration and transformation 6. Languages, utilities and programming environments, tools for batch execution of procedures
Labor function 2: Requirements engineering and software design	**Task 1:** Software requirements analysis	**Skills:**
		1. Analyze compliance requirements 2. Develop implementation options. 3. Evaluate and justify recommended solutions. 4. Communicate with stakeholders
		Knowledge:
		1. Possibilities of the existing software and hardware architecture 2. Possibilities of modern and perspective development tools for software products, hardware 3. Software Development Methodologies and Programming Technologies 4. Methodologies and technologies for designing and using databases
	Task 2: Development of technical specifications for software components and their interaction	**Skills:**
		1. Choose means of implementing software requirements 2. Develop software implementation options 3. Evaluate and justify recommended solutions 4. Communicate with stakeholders

		Knowledge:	
		1. Functional specification formalization languages 2. Methods and techniques for formalizing tasks 3. Software design methods and tools 4. Methods and tools for designing software interfaces 5. Database Design Methods and Tools	
	Task 3: Software design	**Skills:**	
		1. Leverage existing blueprints and software design patterns 2. Apply methods and tools for designing software, data structures, databases, programming interfaces 3. Communicate with stakeholders	
		Knowledge:	
		1. Software architecture principles and types of software architecture 2. Standard solutions, libraries of program modules, templates, object classes used in software development 3. Software design methods and tools 4. Database Design Methods and Tools 5. Methods and tools for designing software interfaces	
Requirements for personal competencies	Structural thinking, perseverance and mindfulness Creative approach, Self-learning ability, Responsibility, Focus on the end result and customer requirements, Business communication skills		
Relationship with other professions within the OQF	6	Software Engineer	
Communication with ETKS or KS	KS	185. Programming Technician 140. Software engineer (programmer)	
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT

PROFESSION CARD **"SPECIALIST IN LAYOUT OF THE GRAPHIC INTERFACE"**			
Code:	2512-2-005		
Group code:	2512-2		
Profession:	Graphical user interface specialist		
Other possible job titles:	Graphic interface designer		
Qualification level for ORK:	6		
The main purpose of the activity	Design and develop a graphical user interface.		
Labor functions	Mandatory labor functions	1. Design, design and heuristic evaluation of the graphical user interface	
		2. Designing user interaction with the system	
	Additional labor functions	-	

Labor function 1: Design, design and heuristic evaluation of the graphical user interface	**Task 1:** Formal assessment of the graphical user interface and analysis of user interaction with the graphical interface	**Skills:** 1. Perform interface expertise 2. Calculate the expected speed of the interface 3. Evaluate use cases for the software interface 4. Use user experience analytics tools 5. Use systems for collecting and analyzing user interaction with the interface 6. Get user experience data from open sources 7. Develop reporting documentation **Knowledge:** 1. Interface Ergonomic Quality Assessment Systems 2. Standards governing the requirements for ergonomics of human-system interaction 3. Software Development Techniques 4. Methods for describing user requirements for a product 5. Interface peer review techniques 6. Ways to make interfaces available 7. Features of ensuring the accessibility of interfaces for users with disabilities 8. Methods of statistical data analysis
Labor function 2: Designing user interaction with the system	**Task 1:** Identification of user needs in the operation of software in terms of graphical user interfaces	**Skills:** 1. Obtain relevant professional information about user interaction with interfaces from open sources and analyze it 2. Conduct user interviews 3. Analyze received information about user interaction with graphical user interfaces 4. Create marketing personas (characters that reflect the target audience) and detailed user interaction paths with the product **Knowledge:** 1. Information collection methods 2. Activity Analysis Methods 3. Techniques for compiling marketing personas and customer journeys 4. Patterns of human behavior when using software products and hardware 5. Standards governing the requirements for ergonomics of human-system interaction 6. Marketing Basics
	Task 2: Designing styles of user interaction with the graphical user interface of a software product	**Skills:** 1. Develop user experience management mechanisms 2. Use mental models in interface design 3. Create uniform interface solutions **Knowledge:** 1. Factors Affecting User Experience 2. Learning Heuristics

		3. Patterns of human behavior when using software products and hardware 4. General Practices for Designing Graphical User Interfaces 5. Standards governing the requirements for ergonomics of human-system interaction 6. Standards governing the interface of software products from different manufacturers 7. Fundamentals of psychology
	Task 3: UI prototype development and testing	**Skills:**
		1. Work in interface prototyping tool environments 2. Define objects and methods for testing the graphical and/or user interface 3. Organize the interface prototype testing process 4. Documenting interface test results
		Knowledge:
		1. User Experience Test Objects 2. Types and Types of User Experience Testing 3. Patterns of people's behavior when using software products 4. Common Interface Design Practices 5. Standards governing the requirements for ergonomics of human-system interaction 6. Standards governing the interface of software products from different manufacturers 7. Fundamentals of psychology
Requirements for personal competencies	Organization, Initiative, Attentiveness, Responsibility Discipline, diligence, result orientation High Learner, Business Communication Skills, Teamwork	
Relationship with other professions within the OQF	5	GUI Architecture Specialist
	6	GUI Architecture Specialist
Communication with ETKS or KS	KS	185. Programming Technician 140 Software Engineer
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies Qualification: Bachelor in ICT

PROFESSION CARD "GRAPHIC INTERFACE ARCHITECTURE DEVELOPER"		
Code:	2512-2-006	
Group code:	2512-2	
Profession:	GUI Architecture Specialist	
Other possible job titles:	Lead Graphic Interface Designer	
Qualifying ORC level:	6	
The main purpose of the activity	Design and study of the architecture of a graphical interface that provides high operational (ergonomic) characteristics of software products and systems	
Labor functions	Mandatory labor functions	1. GUI Architecture Design
		2. Expert analysis of the ergonomic characteristics of software products and/or

		hardware
		3. Optimization of graphic interface solutions
	Additional labor functions	-
Labor function 1: GUI Architecture Design	**Task 1:** Conceptual design GUI	**Skills:**
		1. Sketch interfaces 2. Prototype interfaces 3. Create conditional interface layouts 4. Read, create, modify and design interface block diagrams
		Knowledge:
		1. Technical aesthetics within visual interface design 2. Feature classification systems and their applicability 3. Notations for recording block diagrams, descriptions of the logic of the application 4. Design requirements for relevant platforms and operating systems 5. Appropriate platform and operating system design guides 6. Standards governing the requirements for ergonomics of human-system interaction 7. Interface Design Trends
	Task 2: Creation of structural guidelines for interface design and product standards for GUI	**Skills:**
		1. Develop training material and interface design instructions 2. Use a text markup language 3. Use a stylesheet language 4. Work with layout and layout programs using markup languages
		Knowledge:
		1. Software Development Methods 2. Software development technologies 3. Areas of applicability of template interface solutions 4. Ergonomic standards 5. human-system interaction 6. Methods for working with glossaries of terms 7. Nomenclature of controls for target platforms and operating systems
Labor function 2: Expert analysis of the ergonomic characteristics of software products and/or hardware	**Task 1:** Ergonomic analysis characteristics of software products and hardware	**Skills:**
		1. Evaluate the results of the initial analysis carried out and the limitations identified 2. Conduct user interviews 3. Analyze the received information about the user's activity 4. Create marketing personas (characters that reflect the target audience) and detailed user interaction paths with the product
		Knowledge:
		1. Information collection methods 2. Activity Analysis Methods 3. Techniques for compiling marketing personas and customer journeys 4. Patterns of human behavior when using software products and hardware 5. Ergonomic standards 6. human-system interaction 7. Marketing Basics
	Task 2: Analysis of software products on subject of compliance with tasks users	**Skills:**
		1. Work with various software products and devices (computers, smartphones, tablets, terminals). 2. Identify interface features that affect the performance of tasks by the user (simplify or complicate) 3. Detect non-compliance of the software product with standard solutions
		Knowledge:
		1. Laws of perception of visual information 2. Patterns of human behavior when using software products and hardware 3. Common Interface Design Practices 4. Standards governing the requirements for ergonomics of human-system interaction 5. Standards governing the interface, manufacturers of various software products
Labor function 3: Optimization of graphic interface solutions	**Task 1:** Development of recommendations for optimization interface solutions for software products and hardware	**Skills:**
		1. Develop interface solutions. 2. Follow the standards governing the characteristics of the interface of manufacturers of various software products. 3. Be aware of software and hardware limitations.
		Knowledge:
		1. Principles of perception of information 2. Patterns of human behavior when using software products and hardware 3. Ergonomic standards 4. human-system interaction 5. Standards governing the interface, manufacturers 6. software products, operating systems, platforms 7. Fundamentals of technical aesthetics
	Task 2: Identifying Options interface solutions, the best appropriate to the tasks users	**Skills:**
		1. Work with various software products and devices (computers, smartphones, tablets, terminals) 2. Identify interface features that critically affect the performance of tasks by the user (significantly simplify or complicate) 3. Identify inconsistencies between the interface and the standard solutions of the target platform of the system under study

		Knowledge: 1. Principles of perception of visual information 2. Patterns of human behavior when using software products and hardware 3. Standards governing the requirements for ergonomics of human-system interaction 4. Standards governing the interface, manufacturers of software products, operating systems, platforms	
Requirements for personal competencies	Analytical thinking, Critical analysis, Responsibility Organization, Teamwork, Discipline		
Relationship with other professions within the OQF	5	Graphical user interface specialist	
	6	Graphical user interface specialist	
Communication with ETKS or KS	KS	185. Programming Technician 140 Software Engineer	
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT

PROFESSION CARD

"WEB-MASTER"

Code:	2512-2-008	
Group code:	2512-2	
Profession:	webmaster	
Other possible job titles:	web programmer 2512-1-002 Software Engineer	
Qualifying ORC level:	6	
The main purpose of the activity	Perform work on the creation (modification) and maintenance of web resources	
Labor functions	Mandatory labor functions	1. Creation and support of a web resource
		2. Testing a web resource
		3. Web resource design
	Additional labor functions	-
Labor **feature 1:** Creation and support of a web resource	**Task 1:** Leading the software development process	**Skills:** 1. Apply methods and means of planning and control (monitoring) of the execution of plans. 2. Apply the basic principles and methods of personnel management 3. Apply regulatory and technical documents (standards and regulations), the best world practices for managing the software product development process 4. Plan the software development process 5. Evaluate the quality of the software product development plan (resources, deadlines, risks). 6. Monitor the execution of software product development plans 7. Adjust the software development plan
		Knowledge: 1. Methods and means of planning and control (monitoring) of the execution of plans 2. Methods for assessing the quality of a software product development plan (resources, deadlines, risks) 3. Basic principles and methods of personnel management 4. Regulatory and technical documents (standards and regulations), the best world practices for managing the software product development process
Labor function 2: Testing a web	**Task 1:**	**Skills:**

resource	Organization of work on integration testing of a web resource with external services and accounting systems	1. Test a web resource using test plans 2. Work with test data preparation tools 3. Interpret customer business requirements to write test cases 4. Set requirements for test results 5. Work independently with information 6. Work in a team with other testers and developers
		Knowledge:
		1. Subject area of the project for drawing up test plans 2. Change Management Basics 3. Architecture, device and functioning of computing systems 4. Principles of operation of communication equipment 5. Network protocols and fundamentals of web technologies 6. Fundamentals of modern database management systems 7. The device and functioning of modern web-resources 8. Database theory 9. Database storage and analysis systems 10. Basics of programming 11. Modern standards of interaction between components of distributed applications 12. Software tools and platforms for developing web resources 13. Fundamentals of information security of web resources
	Task 2: Web Resource Health Check Guide	**Skills:**
		1. Prepare test datasets 2. Apply methods and means of checking the health of a web resource 3. Interpret data from message logs, protocols 4. Leverage existing technical and/or software architecture 5. Apply a collaborative software development environment and version control system 6. Apply management decision-making methods
		Knowledge:
		1. Regulatory documents that define the requirements for checking the health of the program code 2. Basic principles of debugging code 3. The main types of diagnostic data and ways to present them 4. Basic methods for measuring and evaluating software performance 5. Methods for preparing test datasets 6. Methods and means of checking the health of the software
Labor function 3: Web resource design	**Task 1:** Designing sections of a web resource	**Skills:**
		1. Apply software tools to design the interface of a web resource 2. Carry out the interface design process taking into account the existing rules for the subject area of the project. 3. Apply tools to evaluate the effectiveness and convenience of the created interface, apply the data obtained to optimize the interface
		Knowledge:
		1. Best Practices for Project Domain 2. The device and functioning of modern web-resources 3. Modern principles of building user interfaces 4. Modern methods for testing the ergonomics of user interfaces 5. Basic requirements for the design of graphical interfaces, methods of transmitting information in text, graphics, sound, video and other multimedia formats, depending on the user category 6. Basics of pedagogical design (for developers of educational web-resources)

		7. Modern domestic and foreign experience in professional activities	
Requirements for personal competencies	Analytical thinking, Critical analysis, Responsibility organization		
Relationship with other professions within the OQF	5	web developer	
	6	web developer	
Communication with ETKS or KS	KS	185. Technician - programmer 140. Software Engineer	
Relationship with the system of education and qualifications	The level of education: Higher (5V ISCED code)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT

3.Professional standard technical data

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The expertise is provided by:	Organisation: 10Tech LLP Experts and contact details of experts: Deputy General Director Boldyrev V.A. **87017173689**
Version number and year of release:	Version 1, 2019
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Appendix No. 13
to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs

Republic of Kazakhstan "Atameken"
No. 222 dated 12/05/2022

Professional standard: "Administration of graphics and operating systems"

Glossary

The following terms and definitions apply in this professional standard:

Information system (IS)- an organizationally ordered set of information and communication technologies, service personnel and technical documentation that implement certain technological actions through information interaction and are designed to solve specific functional problems.

Information technology (IT, IT)is a process that uses a set of means and methods for collecting, processing and transmitting data to obtain information of a new quality about the state of an object, process or phenomenon. Information technology (IT, from the English. Information Technology, IT) is a class of areas of activity related to technologies for managing and processing a huge flow of information using computer technology.

IS maintenance- ensuring the use of the IS put into commercial operation in accordance with its purpose, including measures to correct, modify and eliminate software defects, without upgrading and implementing additional functional requirements and subject to maintaining its integrity.

Database- a set of data organized according to a conceptual structure that describes the characteristics of this data, as well as the relationships between their objects.

Graphical user interface(Graphical User Interface - GUI) - a specific program that provides the ability to use user interface elements in the form of graphical objects.

Graphic systems -this is a set of technical, software, linguistic means and methods of communication between the user and the computer at the level of visual images in solving problems of various classes. Two types of systems are used in automatic design systems: general and specialized.

ICT– Information and communication technologies;
IP- Information Systems;
BY- Software;
PI- User interface;
DB- Database
KS– computer system
HS– graphic system
OS- operating system

1. Professional standard passport

Name of the Professional Standard:	Administration of graphics and operating systems
Professional Standard Number:	
The names of the section, section, group, class, and subclass according to OKED:	J Information and communication 62 Computer programming, consulting and other related services 62.0 Computer programming, consulting and other related services 62.01 Computer programming activities 62.01.1. Software development.
Brief description of the Professional Standard:	Installation and maintenance of graphic and operating systems. Checking the stability, interoperability, portability, security, or scalability of graphics and operating system architectures. Interaction with software developers to ensure compatibility between graphics and operating system components. Determination of the system data of the operating system to interact with the hardware components necessary to meet the needs of users.

2. Occupation cards

List of profession cards	Graphics system administrator	5th - 6th levels of ORC
	Operating systems administrator	5th - 6th levels of ORC

PROFESSION CARD: GRAPHICS ADMINISTRATOR

Code:	2523-0-001		
Group code:	2523-0		
Profession:	Graphics system administrator		
Other possible job titles:	-		
Qualification level for ORK:	6		
The main purpose of the activity:	Carrying out configuration and support of graphic systems		
Labor functions:	Mandatory job functions:	1. Installation and maintenance of graphic systems	
		2. Ensuring the smooth operation of the HS	
	Additional labor functions:	-	
Labor function 1: Installation and maintenance of graphic systems	**Task 1:** Configuring, making changes, deleting the HS	**Skills:**	
		1. Install GS and DBMS and set application launch parameters 2. Configure and administer graphics applications and devices to support graphics systems 3. Install the driver for graphics devices 4. Apply knowledge of the characteristics of graphics devices when establishing interactions with applications	
		Knowledge:	
		1. Definition and classification of modern graphics systems: application programs for working with graphics 2. Modern programming languages 3. Principles of HW design; 4. Architecture for building data centers; 5. Application programming and information recovery methods, including the implementation of input-output subsystems and file subsystems;	
	Task 2: Maintenance of graphic systems (software and hardware)	**Skills:**	
		1. Troubleshoot graphics systems at the application and hardware levels 2. Perform functional maintenance of the system 3. Implement modification changes in the HS 4. Solve problems related to the modification or uninstall the system	
		Knowledge:	
		1. Modern software applications for working with graphics (from simple to complex graphics systems)	

		2. International and national standards for the development and administration of graphics systems 3. Modern programming languages; 4. Control methods in HS by hardware-software complexes.
Labor function 2: Ensuring the smooth operation of the GS	**Task 1:** Performance management and controlhardware and software part of the GS	**Skills:**
		1. Apply special skills to support troubleshooting in emergency situations; 2. Fix simple errors when working in the graphic system (applications + hardware) 3. Match system and peripheral devices to the required graphic applications
		Knowledge:
		1. Graphics system configuration systems 2. Software for diagnostics and troubleshooting; 3. Electrical engineering and construction of structured cable data transmission systems. 4. Ways and means of protecting information, including the administration of devices for the HS.
	Task 2: HS performance monitoring, HS operation and maintenance	**Skills**
		1. Monitor and diagnose graphic systems, collect statistical data; 2. Identify and eliminate errors in the operation of applied, system and hardware tools, elimination of errors. 3. Identify and describe the types of incorrect operation of the graphic system 4. Report system errors 5. Implement a set of measures to counter various threats of unauthorized access.
		Knowledge
		1. Knowledge of drivers to install the required devices 2. Modern graphics applications
Requirements for personal competencies	Logical thinking. Flexibility of thinking. Learnability. Creativity. Organization. Discipline. Attentiveness. Independence in decision making. Accuracy. Responsibility	
Relationship with other professions within the OQF	5-6	Operating systems administrator
Link to ETKS or KS or other job directories	KS	185. Programming Technician 140. Software Engineer
Relationship with the system of education and qualifications	Level of education: higher (ISCED level 6)	Direction: Information and Communication Technologies Qualification: Bachelor in ICT

PROFESSION CARD: OPERATING SYSTEM ADMINISTRATOR

Code:	2523-0-004		
Group code:	2523-0		
Profession:	Operating systems administrator		
Other possible job titles:	-		
Qualification level for ORK:	6		
The main purpose of the activity:	Ensure reliable operation of the OS		
Labor functions:	Mandatory job functions:	1. Installation and maintenance of operating systems	
		2. Determination of operating system system data for interaction with hardware components.	
	Additional labor functions:	-	
Labor function 1: Installation and maintenance of operating systems	**Task 1:** Ensuring the smooth operation of the operating system	**Skills:**	
		1. Check the operating system for errors in establishing communication with peripheral equipment, network access and application software. 2. Carry out preventive work to determine the compatibility of the OS and peripheral equipment 3. Analyze and eliminate errors generated during the operation of the OS 4. Administer system security tools (planning and implementing a security policy that guarantees the protection of data and shared network resources).	
		Knowledge:	
		1. Principles of OS construction, architecture of different types of operating system. 2. Principles of reliability, fault tolerance and compatibility, security and performance. 3.Means and principles of data protection from unauthorized access.	
	Task 2: Analysis and monitoring of OS operation	**Skills:**	
		1.Schedule the operating system 2. Prepare a report based on the results of the analysis and monitoring of processes 3. Document processes, changes, updates in the OS	
		Knowledge:	
		1. Software tools for monitoring OS processes 2. Methods and principles for analysis and reporting	
Labor function 2: Defining operating system system data for interacting with hardware components	**Task 1:** Management of service programs and equipment	**Skills:**	
		1. Develop a plan for studying the production and marketing of operating systems to determine the OS required by the company for PCs and servers 2. Take part in conferences and forums on OS development, to maximize the use of OS functionality in the company's work 3. Submit requests for modifications and changes 4. Assess the impacts of proposed changes	
		Knowledge:	
		1. Classification of operating systems 2. Administration tools: for managing the console, editing the registry.	
	Task 2: Using OS features	**Skills:**	
		1. Expand the functionality of the OS 2. Create or supplement interfaces for interaction with other systems;	

		3. Use the console tree, snap-ins in the OS to manage OS functions 4. Administer users and user groups (planning, creating and maintaining account information for users and groups).	
		Knowledge:	
		1. Purpose, parameters of the system registry and registry keys (defined by the system, defined by the user) 2. Console commands for testing and running the operating system. 3. Purpose of root registry keys 4. Commands for working on the command line	
Requirements for personal competencies	Logical thinking. Flexibility of thinking. Learnability. Organization. Attentiveness. Independence in decision making. Discipline. Accuracy.		
Relationship with other professions within the OQF	5-6	Graphics system administrator	
Communication with ETKS or KS	KS	185. Programming Technician 140. Software Engineer	
Relationship with the system of education and qualifications	Level of education: higher (ISCED level 6)	Direction: Information and Communication Technologies	Qualification: Bachelor in ICT

3.Professional standard technical data

Designed by:	Limited Liability Partnership “System Research Company “Factor” Project leader: Gabbasov M.B. Contact details of the head: Mars0@mail.ru +7 701 9082511 Project executors and contact details of executors: Isin N.K. info@itk.kz +7 701 1111871 Abdeshov H.U. habdeshov@rambler.ru +7 777 2505831 Akanova A.S. akerkegansaj@mail.ru +77054480680 Approved by the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 259 dated December 24, 2019
The expertise is provided by:	Organisation: 10Tech LLP Experts and contact details of experts: Deputy General Director Boldyrev V.A. 87017173689
Version number and year of release:	Version 1, 2019
Updated:	ALE "International Association for Certification and Development of Information Technologies Master-It" Chairman: Omarov Zh.B. Artists: Kaisenov K.K. master_it_rk@mail.ru +7 701 2140195 Danilov M.S. marymasterit@mail.ru +7 777 8151000 College of Kazakhstan Engineering and Technology University Shalabaeva M.Kh. m.shalabaeva@mai.ru +7 701 4735134 Kazakhstan Reading Association Zeynegul K. Zikonti24@gmail.com +7 701 1913948 "Orleu" biliktilikti arttyru ulttyk ortalygy" Mukhamedzhanova S.T. orleualmaty@inbox.ru +7 778 2007402 IT school of service LLP "SDM-Services" Rybalko L.V. sdm.k@bk.ru +7 705 2090213 Global Education Group Inc. Ltd (London) Nurzhanova H. eva.global.london@bk.ru +7 701 1119480 Agency of IT products PR-KZ-MEDIA LLP Zhrebtsov S.V. infoprkzmedia@bk.ru +7 707 7888101
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Appendix No. 20
to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs
Republic of Kazakhstan "Atameken"
No. 222 dated 12/05/2022

Professional Standard: Software Maintenance

Glossary

The following terms and definitions apply in this professional standard:

Information system (IS)- an organizationally ordered set of information and communication technologies, service personnel and technical documentation that implement certain technological actions through information interaction and are designed to solve specific functional problems.

Information technology (IT, IT)is a process that uses a set of means and methods for collecting, processing and transmitting data to obtain information of a new quality about the state of an object, process or phenomenon. Information technology (IT, from the English. Information Technology, IT) is a class of areas of activity related to technologies for managing and processing a huge flow of information using computer technology.

IS maintenance- ensuring the use of the IS put into commercial operation in accordance with its purpose, including measures to correct, modify and eliminate software defects, without upgrading and implementing additional functional requirements and subject to maintaining its integrity.

Information system architecture- a concept that defines the model, structure, functions performed and the relationship of the components of the information system.

Database- a set of data organized according to a conceptual structure that describes the characteristics of this data, as well as the relationships between their objects.

Graphical user interface(Graphical User Interface-GUI) - a specific program that provides the ability to use user interface elements in the form of graphical objects.

User Interface (UI)- elements of the system interface that are used by the user while working in the system (menus, buttons, dialog boxes) in the form of objects, which takes into account the color scheme, size, style and other graphic features.

Program development automation systems (CASE - tools)- a set of software engineering tools and methods for software design that helps to ensure high quality programs, the absence of errors and ease of maintenance of software products.

IR– Information and communication technologies;

BY- Software;

DB- Database

1. Professional standard passport

Name of the Professional Standard:	Software maintenance
Professional Standard Number:	
The names of the section, section, group, class, and subclass according to OKED:	J Information and communication 62 Computer programming, consulting and other related services 62.0 Computer programming, consulting and other related services 62.01 Computer programming activities 62.01.1. Software development.
Brief description of the Professional Standard:	Setting up, configuring, monitoring, upgrading, eliminating software failures, assessing the adequacy and effectiveness of the internal control system and the risk management system in the field of information technology, conducting and maintainingparticipation in complex information security audits, management of planning and conducting audit procedures,development of programs, methods of checks on the audit of information technology.

2. Occupation cards

List of profession cards	Software Maintenance Specialist	5th - 6th levels of ORC
	ICT auditor	6th - 7th levels of ORC

PROFESSION CARD:SOFTWARE MAINTENANCE SPECIALIST

Code:	2513-0-001		
Group code:	2513-0		
Profession:	Software Maintenance Specialist		
Other possible job titles:	-		
Qualification level for ORK:	6		
The main purpose of the activity:	Organize software upgrades based on bug fixes.		
Labor functions:	Mandatory job functions:	1. Software product monitoring and error detection	
		2. Participation in software upgrades	
	Additional labor functions:	-	
Labor function 1: Software product monitoring and error detection	**Task 1:** Organization of work to eliminate failures and errors	**Skills:**	
		1. Conduct an analysis to eliminate and restore the functionality of the software 2. Install virus protection. 3. Solve issues of software reliability.	
		Knowledge:	
		1. Antivirus software 2. Modern programming languages 3. Theory of queuing	
	Task 2: System error detection and failure handling	**Skills:**	
		1. Maintain software databases 2. Maintain file systems 3 . Advise on the operation of the software 4. Conduct an analysis to determine the benefits of new software with evidence of its superiority over old software 5. Compile a report on the analysis of the software	
		Knowledge:	
		1. Knowledge of modern software applications.	

		2. Database management systems 3. Operating systems and their structure.
Labor function 2: Participation in software upgrades	**Task 1:** Improvement of individual modules of the program	**Skills:**
		1. PSolve individual tasks in accordance with a new or additional technical task for a software product. 2. Follow proceduresenhancements to the functionality or performance of the software 3.Perform functional maintenance of software on customer machines.
		Knowledge:
		1. Software life cycle 2. Programming, types and data structures. 3.Software architecture and functionality
	Task 2: Restoring, updating, deleting, modifying software files	**Skills:**
		1. Fix software bugs in software files 2. Restore the work of memory, files, register errors 3. Perform systematic software maintenance (update, protect, upgrade) up todecommissioning. 4.Monitor the operation of the software, take notes and make suggestions for improving the place where conflicts are systematically detected
		Knowledge:
		1. The structure of operating systems 2. Fundamentals of project activities and phases of the software life cycle 3. International and national standards and requirements for software maintenance
Requirements for personal competencies	Logical thinking. Flexibility of thinking. Organization. Creativity. Sociability. Learnability. Attentiveness. Discipline. Independence in decision making.	
Relationship with other professions within the OQF	6-7	ICT auditor
Link to ETKS or KS or other job directories	KS	185. Programming Technician 140. Software Engineer
Relationship with the system of education and qualifications	Level of education: higher (ISCED level 6)	Direction of training: Information and communication technologies Qualification: Bachelor in ICT
3.Professional standard technical data		
Designed by:	Limited Liability Partnership “System Research Company “Factor” Project leader: Gabbasov M.B. Contact details of the head: Mars0@mail.ru +7 701 9082511 Project executors and contact details of executors: Isin N.K. info@itk.kz +7 701 1111871 Abdeshov H.U. habdeshov@rambler.ru +7 777 2505831 Akanova A.S. akerkegansaj@mail.ru +77054480680 Approved by the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 259 dated December 24, 2019	
The expertise is provided by:	Organization: LLP "Tamur" Experts and contact details of experts: General Director Berentaev B. 870171476511	
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Application No. 1
to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs
Republic of Kazakhstan "Atameken"
No. 222 dated 12/05/2022

professional standard
"Database Administration"

1. General provisions

1. The professional standard "Database Administration" is intended for the formation of educational programs, including for training personnel at enterprises, for certification of employees and graduates of educational institutions, for solving a wide range of tasks in the field of personnel management.

On the basis of this professional standard, organizations can develop corporate professional standards for employees for internal use, specifying the level of professional education, the list of labor functions, knowledge, skills and abilities, taking into account the specifics of the organization of production, labor and management, and their responsibility.

2. The following terms and definitions apply in this professional standard:

1) qualification - the degree of readiness of an employee for the qualitative performance of specific labor functions;

2) qualification level - a set of requirements for the level of training and competence of an employee, differentiated byparameters of complexity, non-standard work actions, responsibility and independence;

3) national qualifications framework - a structured description of qualification levels recognized in the labor market;

4) national system of qualifications - a set of mechanisms for legal and institutional regulation of demand and supply for the qualifications of specialists from the labor market;

5) industry qualifications framework - a structured description of the qualification levels recognized in the industry;

6) professional group - a set of professional subgroups that has a common integration basis (similar or close purpose, objects, technologies, including labor tools) and implies a similar set of labor functions and competencies for their performance;

7) professional subgroup - a set of professions, formed by a holistic set of labor functions and the competencies necessary for their performance;

8) professional standard - a standard that defines in a particular area of professional activity the requirements for the level of qualification and competence, content, quality and working conditions;

9) profession - the main occupation of a person's labor activity, requiring certain knowledge, skills and practical skills acquired as a result of special training and confirmed by relevant documents on education;

10) labor function - a set of interrelated actions aimed at solving one or more tasks of the labor process.

3. The following abbreviations are used in this professional standard:

1) SQF - sectoral qualification framework;

2) PS - professional standard;

3) KS - qualification directory of positions of managers, specialists and other employees;

4) Software - software;

5) DB - database;

6) IS - information security;

7) DBMS - database management system;

8) OS - operating system;

9) IS - information system.

2. Professional standard passport

PS name:	"Database Administration"
Purpose of PS development:	Systematic and structured description of labor functions, relevant requirements for knowledge, skills, abilities and personal competencies of employees.
Brief description of the PS:	Installing, configuring, monitoring the functioning of database management systems, providing information security, managing enterprise database backups, developing the area of enterprise activity in terms of ensuring fault tolerance of the database server (s).
Group names	Main group: Information and communication technologies. Professional group: Implementation and administration of database management systems. Professional subgroup: Database implementation and maintenance.

3. Occupation cards

List of professions	DBA	4th level of ORK
	DBA	Level 5 ORC
	DBA	6th level of ORC

PROFESSION CARD
"DATABASE ADMINISTRATION SPECIALIST"

Profession code:	2139 "IT professionals not included in other groups"
Profession name:	"Database Administrator"
ORK qualification level:	6. Higher education, practical experience
Qualification level for CS	-
Labor functions	1) Installing and configuring software. 2) Security functioningD B . 3) Monitoring And control reservecopying the database. 4) Ensuring database IS. 5) Analysis And setting DBMS performance. 6) Ensuring the smooth operation of the database. 7) Database development management.
Labor function 1	**Skills and abilities:**
Installing and configuring software	1. Evaluation and development of requirements for the hardware and software complex, based on the prospects for using the database. 2. Design hardware and softwarecomplex for installing the database. 3. Choice most efficient DBMS Forsoftware installation and configuration. 4. Design structures DB With taking into accountprospects for using the database. 5. Implementation efficient settingshardware-software complex. 6. Use of technical documentation for installing and configuring software.
	Knowledge: 1. Technical characteristics hardware-software complex. 2. Features of various DBMS. 3. DBMS requirements. 4. Requirements for system and application software. 5. Mechanisms for managing resources of the hardware-software complex. 6. IS architecture using databases. 7. Database design. 8. Methods and principles of information security.
Labor function 2 Ensuring the functioning of the database	**Skills and abilities:** 1. Analysis and taking measures to resolve complex emergency situations and incidents that arise during the operation of the DBMS. 2. Analysis of information about the operation of the database obtained during the operation of the database. 3. Coordination of database administration work. 4. Development regulatory and technicaldocumentation on the functioning of the database. 5. Analysis of the need to upgrade the hardware and software complex based on the results of the operation of the database. 6. Forecast and risk assessment of database failures.

	Knowledge: 1. The composition of the operating hardware and software complex and the technical characteristics of its components. 2. Composition and functionality of database administration software. 3. Methods for monitoring the functioning of the database. 4. Information analysis methods. 5. Fundamentals of risk management.
Labor function 3 Monitoring And controldatabase backup	**Skills and abilities:** 1. Development regulatory and technicaldatabase backup documentation. 2. Organization and control of execution of work on database backup. 3. Control performance regulating database backup documents.
	Knowledge: 1. hardware and software complex,used in various database backup systems, and the technical characteristics of its components. 2. Modern system and application software for performing database backup and recovery procedures. 3. Methods for creating database backup procedures. 4. Features and differences of the hardware-software complex for storing backup copies of the database.
Labor function 4 Ensuring database IS	**Skills and abilities:** 1. Analysis of possible database security threats. 2. Development regulatory and technicaldocumentation to ensure database IS. 3. Use of means and methods of control of access to a DB. 4. Compliance with the enterprise information security policy.
	Knowledge: 1. Various database management systems. 2. Facilities And methods management accountingdatabase user records. 3. Various methods for ensuring database security when using application software. 4. Means and methods of database access control. 5. Methods and principles of information security.
Labor function 5 Analysis And DBMS performance tuning	**Skills and abilities:** 1. Analysis of statistical information to assess the performance of the database. 2. Using the range of available database management tools and methods to assess the load when executing database queries. 3. Analysis and evaluation of the effectiveness of the functioning of the database. Development of a long-term plan for the development of a hardware and software complex in order to increase the performance of the DBMS.
	Knowledge: 1. Tools for monitoring, collecting and analyzing statistical information about the operation of the database. 2. Various methods and tools for analyzing and evaluating database performance. The composition of the operating hardware and software complex and the technical characteristics of its components.
Labor function 6 Ensuring the smooth operation of the DBMS	**Skills and abilities:** onstruction and administration of the cluster architecture of database servers. 2. Inspection of the state of the DBMS and database servers in order to implement preventive measures for maximum IS availability. 3. Analysis and identification of the causes of failures in the operation of the DBMS with their subsequent elimination. 4. Development of procedures for emergency situations related to the operation of the DBMS, as well as when restoring the database.

	Knowledge: 1. The composition of the operated software and hardware-software complex. 2. Methods effective recoveryperformance of the DBMS and database. 3. Existing methods settingsdatabase mirroring and database replication methods. 4. Facilities And mechanisms updatesoperated software.
Labor function 7 Database development management	**Skills and abilities:** 1. Analysis of the hardware and software complex market. 2. Development of a strategy for the development of the use of DBMS in the organization. 3. Learning best practices in database administration. 4. Planning for software upgrades and/or data migration. 5. Carrying out work on installing updates to the DBMS version after preliminary testing of updates in a test environment.
	Knowledge: 1. World experience use systemsdatabase management. 2. Database development strategies and organization database management system. 3. Facilities And mechanisms updatesoperated software.
Requirements To personal competencies	organization, initiative, attentiveness, responsibility, discipline, performance,analytical thinking, planning, decision making, critical analysis, result orientation, striving for professional development, work in team.
Connection With others professions V within the RFC	2131 System architect 213 Team leader
Professional Standard Specifications	
Developed	JSC"National infocommunication Holding "Zerde" Approved by the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs Republic of Kazakhstan "Atameken" No. 171 dated July 17, 2017
Version number and year of release	Version 1, 2015
Date of indicative revision	2018
Updated:	CIB ICRIAP RK
The expertise is provided by:	Organization: ALE "Kazakhstan Information Security Association" Experts and contact details of experts: General Director Pokusov V.V. +7 771 716 18 16
Version number and year of release:	Version 2, 2022
Date of indicative revision:	2025

Application No. 6
to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs
Republic of Kazakhstan "Atameken"
No. 222 dated 12/05/2022

Professional standard: "Conducting web monitoring"

Glossary

The following terms and definitions apply in this professional standard:

Information system (IS)- an organizationally ordered set of information and communication technologies, service personnel and technical documentation that implement certain technological actions through information interaction and are designed to solve specific functional problems.

Information technology (IT, IT)is a process that uses a set of means and methods for collecting, processing and transmitting data to obtain information of a new quality about the state of an object, process or phenomenon. Information technology (IT, from the English. Information Technology, IT) is a class of areas of activity related to technologies for managing and processing a huge flow of information using computer technology.

IS maintenance- ensuring the use of the IS put into commercial operation in accordance with its purpose, including measures to correct, modify and eliminate software defects, without upgrading and implementing additional functional requirements and subject to maintaining its integrity.

Information system architecture- a concept that defines the model, structure, functions performed and the relationship of the components of the information system.

Database- a set of data organized according to a conceptual structure that describes the characteristics of this data, as well as the relationships between their objects.

Redesign– modification of the graphic and / or structural and functional components of an existing site or software product

Rendering -the process of obtaining an image from a model using a computer program

Graphical user interface(Graphical User Interface - GUI) - a specific program that provides the ability to use user interface elements in the form of graphical objects.

User-centric design(User Centered Design) - provides a combination of ergonomic, aesthetic, artistic requirements for the system

User Interface (UI)- elements of the system interface that are used by the user while working in the system (menus, buttons, dialog boxes) in the form of objects, which takes into account the color scheme, size, style and other graphic features.

SQL (Structured Query Language)- Structured query language, a declarative programming language for creating, modifying and managing data.

OLAP(English Online Analytical Processing, interactive analytical processing) is a data processing technology that consists in preparing summary (aggregated) information based on large data arrays structured according to a multidimensional principle.

Product Analyst -Analyst conducted big data analysis to predict product behavior.

B.I. (Busines sintelligence) - translation of transactional business information into a human-readable form

ICT– Information and communication technologies;

BY- Software;

DB- Database

CRM(Customer Relationship Management) - customer relationship management system

1. Professional Standard Passport		
Name of the Professional Standard:	Carrying out web monitoring	
Professional Standard Number:		
The names of the section, section, group, class, and subclass according to OKED:	J Information and communication 62 Computer programming, consulting and other related services 62.0 Computer programming, consulting and other related services 62.01 Computer programming activities 62.01.1. Software development.	
Brief description of the PS:	Providing transactional business information in a human-readable form, interpreting large amounts of data, modeling initial courses of action, maintaining a business solution. Working with big data, studying metrics, building a funnel, monitoring changes, using a statistical significance indicator. Applying the Data Driven Development approach. Monitoring website traffic, studying the behavior of visitors.	
2. Occupation cards		
List of profession cards	web analytics specialist	6th and 7th levels of ORC
	BI systems specialist	6th and 7th levels of ORC
	Product analytics specialist	6th and 7th levels of ORC
PROFESSION CARD: WEB ANALYSIS SPECIALIST		
Code:		
Group code:		
Profession:	web analytics specialist	
Other possible job titles:	-	
Qualification level for ORK:	6	
The main purpose of the activity:	Collection and analysis of data about site visitors	
Labor functions:	Mandatory job functions:	1. Analysis of the behavior of site visitors
		2. Search engine optimization for website promotion
	Additional labor functions:	-
Labor function 1: Website visitor behavior analysis	**Task 1:** Development of programs for collecting information about the behavior of site visitors	**Skills:**
		1. Program / create pop-up applications to attract visitors, automatic mailings by SMS and e-mail, chat bots for various social applications using common platforms Chatfuel, Manychat, Motion.ai, Flow.XO, Botsify 2. Use Node.js, PHP, Java, Python and other programs to create chat bots and mailing programs 3. Create Push Notifications
		Knowledge:
		1. Fundamentals of programming, scripting programming languages, etc. 2. Methods and principles of marketing organization 3. Chatbot Development Platforms
	Task 2: Work on processing data for the content and database of the site	**Skills:**
		1.Develop SQL queries on the site and collect data on regular visitors 2. Organize a database for analyzing data on the behavior of visitors 3. Make analytical measurements and issue solutions for organizing the work of a marketer
		Knowledge:
		1. Knowledge of current (modern) software tools for data analysis 2. SQL query language 3. Methods and principles of database design 4. Fundamentals of data analysis and working with big data
Labor function 2: Search engine optimization for website promotion	**Task 1:** Site Vulnerability Prevention	**Skills:**
		1. Identify emerging PI errors 2. Make decisions about fixing emerging problems at the user level 3. Index content, disable page indexing, use keyword planner 4. Create reports on SearchConsole performance
		Knowledge:
		1. Methods and principles of PI development 2. Programming languages 3. Website development technology 4. Types of attacks and methods to prevent them
	Task 2:	**Skills**

	Extracting data from web resources	1. Perform data parsing with subsequent saving in the required format. 2. Classify the data according to the requested criteria 3. Create a database and store the extracted data in a data warehouse	
		Knowledge	
		1.Data extraction approaches: parsing DOM tree, using XPath, parsing strings, using regular expressions, XML parsing, visual approach. 2. Scripting programming languages and search algorithms, data types and so on	
Requirements for personal competencies	Responsibility. performance. Logical thinking. Flexibility of thinking. Result orientation. Organization. Creativity. Attentiveness. Independence in decision making. Accuracy. Responsibility.		
Relationship with other professions within the OQF	6-7	BI systems specialist	
	6-7	Product analytics specialist	
Link to ETKS or KS or other job directories	KS	140. Software Engineer 96. Project manager 157. Programmer (web master, web designer)	
Relationship with the system of education and qualifications	Level of education: higher (ISCED level 6)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT
PROFESSION CARD: BI SYSTEMS SPECIALIST			
Code:			
Group code:			
Profession:	BI systems specialist		
Other possible job titles:			
Qualification level for ORK:	6		
The main purpose of the activity:	Conduct data analysis from the data warehouse		
Labor functions:	Mandatory job functions:	1. Designing and creating a database	
		2. Visualization and report generation of data for business analysis	
	Additional labor functions:	-	
Labor function 1: Designing and creating a database	**Task 1:** Database development and work with data	**Skills:**	
		1. Determine data types and database structure for implementation at the logical and physical levels 2. Perform normalization, denormalization of the database, labeling and standardization of data 3. Organize interaction with unstructured data sources	
		Knowledge:	
		1. Basics of database design 2. OLAP technologies and theoretical foundations of multidimensional databases 4. Knowledge of the SQL query language	
	Task 2: Providing reporting	**Skills:**	
		1. Create bots with analytical alerts (in case of significant deviations) in real time 2. Conduct group consolidation, budgeting and compilationrolling forecasts. 3. Leadstatistical inferenceand probabilistic modeling 4. Provide business information in a convenient, concise manner.	
		Knowledge:	
		1. Reporting tools for project budgeting, reporting consolidation 2. Real time basics 3. Data warehouse structure	
Labor function 2: Visualization and report generation of data for business analysis	**Task 1:** Data Modeling and Rendering	**Skills:**	
		1. Apply data visualization algorithms 2. Process the received visual data 3. Organize the storage of visual data 4. Use and manage the data rendering program 5. Select data and produce to build a model with the desired accuracy	
		Knowledge:	
		1. Operating systems and programming basics 2. Fundamentals of data science 3. Principles and methodsmodeling and rendering	
	Task 2: Organization of the process of documenting the results of the analysis	**Skills:**	
		1. Classify data according to the degree of application in business processes 2. Explore many different data sources and then draw accurate conclusions about them. 3. Use online business intelligence tools to conduct data analysis 4. Conduct analytical performance calculations that can be used for management decisions	
		Knowledge:	
		1. Business process management 2. Big data analysis 3. Programming languages for data analysis	
Requirements for personal competencies	Responsibility. performance. Logical thinking. Flexibility of thinking. Result orientation. Organization. Creativity. Attentiveness. Independence in decision making. Accuracy. Responsibility.		
Relationship with other professions within the OQF	6-7	web analytics specialist	
	6-7	Product analytics specialist	
Link to ETKS or KS or other job directories	KS	140. Software Engineer 96. Project manager	
Relationship with the system of education and qualifications	Level of education: higher (ISCED level 6)	Direction of training: Information and communication technologies	Qualification: Bachelor in ICT
3.Professional standard technical data			

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