

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN  
RSE with EMR "M.AUEZOV SOUTH KAZAKHSTAN STATE UNIVERSITY" MES RK



## EDUCATIONAL PROGRAM

📍 160012, Shymkent city, Tauke Khan Avenue, 5  
☎ (8-725-2) 21-01-41, fax: (8-725-2) 21-01-41  
✉ canselyarya@mail.ru, info@ukgu.kz  
📘 @official.ukgu.kz  
📷 @auezov\_university

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MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF  
KAZAKHSTAN

M.Auezov SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»  
Chairman of the Board  
Rector  
Doctor of historical sciences  
Academician, Kozhamzhareva D.P.



**EDUCATION PROGRAMME**

6B06110 – Computer science

Registration number	6B06100028
Code and classification of education	6M06 Information and communication technologies
Code and Classification of Areas of Training	6M061 Information and communication technologies
Group of educational programs (EP)	B057 Information technologies
Type of EP	Acting EP
ISCE level	6
NQF level	6
IQF level	6
Language learning	Kazakh, Russian, English
The complexity of the EP	240 credits
Distinctive features of EP	-
Partner University (JEP)	-
University Partner ( DDEP )	-

Shymkent, 2023

Developers:

Full Name	Position	Signature
Shomanbayeva M.T.	Associate Professor	
Zhaidakbayeva L.K.	Associate Professor	
Karatayev G.S.	Lecturer of the Department of Informatics	
Tokhtar Rakhat	Student of group EP-20-5k	
Idiyatullayev Mirkassym	Student of group EP-20-7k	
Nurmukhanbetova G.K.	Director of «KaztilDamu» LLP, The educational center, Cand.ped.sc.	
Myrzasalieva A.S.	Director of the South Kazakhstan College of Humanities and Economics	
Utegenov M.K.	Director of the Higher College of New Technologies named after M. Utebayev	
Azhidinov A.S.	1-st Vice-Rector of "Central Asian Innovation University" LLP, cand.tech.sc., Professor.	
Suleymenova L.A.	Head of the Department "Informatics" of the South Kazakhstan State Pedagogical University, cand.tech.sc.	

The EP was considered at a meeting of the Academic Committee in the direction of training on Natural Sciences, Mathematics and Statistics,

Minutes # 7 «21» 02 2023 y.

Chairman of the Committee Shertayev E.T.

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU

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Chairman of the Educational and Methodological Council R. Abisheva

The EP was approved by the decision of the Academic Council of the University

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## 1. CONCEPT OF THE PROGRAM

<b>University Mission</b>	Generating new competencies, training a leader who translates research thinking and culture.
<b>University Values</b>	<ul style="list-style-type: none"> <li>• Openness—open to change, innovation and cooperation.</li> <li>• Creativity – generates ideas, develops them and turns them into values.</li> <li>• Academic freedom – free to choose, develop and act.</li> <li>• Partnership – creates trust and support in a relationship where everyone wins.</li> <li>• Social responsibility – ready to fulfill obligations, make decisions and be responsible for their results.</li> </ul>
<b>Graduate Model</b>	<ul style="list-style-type: none"> <li>• Deep subject knowledge, their application and continuous expansion in professional activity.</li> <li>• Information and digital literacy and mobility in rapidly changing conditions.</li> <li>• Research skills, creativity and emotional intelligence.</li> <li>• Entrepreneurship, independence and responsibility for their activities and well-being.</li> <li>• Global and national citizenship, tolerance to cultures and languages.</li> </ul>
<b>The uniqueness of the educational program</b>	The uniqueness of the EP 6B06110-"Computer Science" is to provide fundamental knowledge in the field of application programming, information and network security, information protection from viruses and network attacks, IT communications, computer systems architecture. Training students in this study program provides a wide range of opportunities for students in the following areas: solving applied problems from various fields, developing computer application software, programming in high-level languages based on modern programming paradigms. The level of training allows graduates to be in demand in various fields of activity using computers and information and communication technologies, IT technologies.
<b>Academic Integrity and Ethics Policy</b>	The University has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination: <ul style="list-style-type: none"> <li>• Rules of academic integrity (Minutes of the Academic Council No. 3 dated 30.10.2018);</li> <li>• Anti-Corruption Standard (Order No. 373 n/a dated 27.12.2019).</li> <li>• Code of Ethics (Protocol of the Academic Council No. 8 dated 31.01.2020).</li> </ul>
<b>Regulatory and legal framework for the development of EP</b>	<ol style="list-style-type: none"> <li>1. Law of the Republic of Kazakhstan "On Education";</li> <li>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 with amendments and additions dated December 29, 2021 No. 614</li> <li>3. State obligatory standards of higher and postgraduate education, approved by order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20.2022 No. 2;</li> <li>4. Rules for organizing the educational process on credit technology of</li> </ol>

	<p>education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152;</p> <p>5. Qualification directory of positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553.</p> <p>6. Guidelines for the use of ECTS.</p> <p>7. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the Center for the Bologna Process and Academic Mobility No. 45 o / d dated June 30, 2021</p>
<b>Organization of the educational process</b>	<ul style="list-style-type: none"> <li>• Implementation of the principles of the Bologna Process</li> <li>• Student-centered learning</li> <li>• Availability</li> <li>• Inclusivity</li> </ul>
<b>Quality assurance of EP</b>	<ul style="list-style-type: none"> <li>• Internal quality assurance system</li> <li>• Involvement of stakeholders in the development of the Educational Program and its evaluation</li> <li>• Systematic monitoring</li> <li>• Actualization of the content (updating)</li> </ul>
<b>Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs(SSN)</b>	<p>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 <a href="http://lib.ukgu.kz/">http://lib.ukgu.kz/</a> is open 24/7.</p> <p>An individual differentiated approach is provided for all types of classes and in the organization of the educational process.</p>
<b>Requirements for applicants</b>	<p>They are established according to the Standard Rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education by Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated 31.10.2018.</p>

## 2. PASSPORT OF THE EDUCATIONAL PROGRAM

<b>Purpose of the EP</b>	To train highly qualified specialists and development engineers in demand in the field of computer science, computer technology and IT technologies.
<b>Tasks of the EP</b>	<p>The formation of socially responsible behavior in society, understanding the importance of professional ethical norms and following these norms;</p> <ul style="list-style-type: none"> <li>- providing lifelong learning skills and abilities that will enable them to successfully adapt to changing conditions throughout their professional career;</li> <li>- providing conditions for acquiring a high general intellectual level of development, mastering competent and developed speech, culture of thinking and skills of scientific organization of work in areas of activity using computers and information and communication technologies, IT technologies;</li> <li>- formation of the competitiveness of graduates in the fields using computer technology and IT technologies to ensure the possibility of their fastest possible employment in their specialty or continuing their studies in a master's degree.</li> </ul>
<b>Harmonization of EP</b>	<ul style="list-style-type: none"> <li>• 6th level of the National Qualifications Framework of the Republic of Kazakhstan;</li> <li>• Dublin descriptors of the 6th level of qualification;</li> <li>• 1 cycle of a Framework for Qualification of the European Higher Education Area);</li> <li>• 6<sup>th</sup> Level of European Qualification Framework for Life long Learning).</li> </ul>
<b>Connection of the EP with the professional sphere</b>	<p>Professional standards approved by PNPP RK "Atameken":</p> <ul style="list-style-type: none"> <li>- "Database Administration" (No. 2 dated April 6, 2017, Updated No. 222 dated December 5, 2022),</li> <li>- "Software development", (order No. 171 dated 07/17/2017, updated No. 222 dated 12/05/2022),</li> <li>- "Creation and management of information resources" (Order No. 171 dated July 17, 2017),</li> <li>- "Software developers and specialists in testing, WEB and multimedia applications" (No. 330 dated 05.12.2018),</li> <li>- "Providing software maintenance" (No. 2 dated April 6, 2017, updated No. 222 dated December 5, 2022).</li> </ul> <p>The sectorial framework of qualifications in the field of education, approved by Minutes No. 2 of the meeting of the sectorial tripartite commission on social partnership and regulation of social and labour relations under the Ministry of Education and Science of the Republic of Kazakhstan dated November 23, 2016.</p>
<b>Name of the degree awarded</b>	After the successful completion of this EP, the graduate is awarded a bachelor's degree in the field of Information and Communication technologies in the educational program 6B06110 "Informatics".
<b>List of qualifications and positions</b>	Primary Jobs Computer Science (Knowledge Processing Specialist, Information Security Specialist, System Analysts (General), IT Consultants and Business Analysts, Software Architects, Software Developers and Testers, Web and Mobile Application Developers and

	Testers, software maintenance professionals, information technology auditors, database administrator; database maintenance engineer, teacher of computer science in secondary and secondary specialized educational institutions (research institutions, design and design organizations) without presenting requirements for experience work in accordance with the qualification requirements of the Qualification Directory for the positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012 No. 201-ø-m.
<b>Field of professional activity</b>	research centers, government bodies, educational institutions and organizations of various forms of ownership, using mathematical methods and computer technologies to solve professional problems.
<b>Objects of professional activity</b>	information and communication technologies, computer systems and networks; mathematical and algorithmic models; high-speed computing systems; hardware and software for solving problems of science, education, engineering, economics and management.
<b>Subjects of professional activity</b>	<ul style="list-style-type: none"> <li>- modern mathematical methods, methods of applied mathematics, computer science for solving problems of science, education, engineering, economics and management.</li> <li>- software and hardware for regional and global information networks, and the development of Internet technologies;</li> <li>- hardware for the development of modern operating systems based on the principles of reliability and fault tolerance, the design of real-time systems, processing, distributed data using parallel computers;</li> <li>- software for computer visualization of tasks of science and technology, animation of natural processes, abstract concepts in scientific research and educational activities.</li> </ul>
<b>Types of professional activity</b>	<ul style="list-style-type: none"> <li>• scientific research;</li> <li>• scientific - technological;</li> <li>• scientific production;</li> <li>• organizational and managerial;</li> <li>• educational.</li> </ul>
<b>Learning outcomes</b>	<p><b>LO1.</b> Communicate freely in a professional environment and society in Kazakh, Russian and English, following the principles of academic honesty.</p> <p><b>LO2.</b> Demonstrate natural science, mathematical, social, socio-economic and engineering knowledge in professional activities, knowledge of methods of mathematical data processing, scientific and experimental research, regulatory documents and elements of economic analysis.</p> <p><b>LO3.</b> Possess information and computational literacy, the ability to generalize, analyze and perceive information, set a goal and choose ways to achieve it.</p> <p><b>LO4.</b> Competently solve professional problems in the field of information technology management and automation of technological complexes using modern information communication technologies, modern hardware and software that are part of the hardware and software of information networks, in the field of information and network security,</p>



information protection.

**LO5.** Apply basic information processing algorithms to solving applied problems, evaluating the complexity of algorithms for programming, evaluating the accuracy of the results obtained and testing the program, choosing the most convenient technologies and application architectures for use.

**LO6.** Make managerial and economic decisions based on information technology, analyzing the business processes of the subject area and establishing structural relationships between the components of the information space.

**LO7.** Use the possibilities of application software packages for solving problems of computational mathematics; applying modern mathematical apparatus, basic knowledge of natural sciences, mathematics and computer science, basic facts, concepts, principles of theories related to applied mathematics and computer science.

**LO8.** Work in instrumental environments of basic programming languages using professionally-oriented software tools and integrated environments to create information and computer models of objects, phenomena, systems, including 3D, to program the movement of the robot and the reaction of the robot to sensors.

**LO9.** Develop websites and various applications for information processing.

**LO10.** Possess skills in developing software applications for mobile devices, creating software for computers and systems of various architectures, designing, constructing and testing software products, as well as modeling, analyzing and using formal methods for designing software, functioning of operating systems.

**LO11.** Transfer the result of the conducted physical, mathematical and applied research in the form of specific recommendations, expressed in terms of the subject area of the studied phenomenon.

### 3.COMPETENCES OF THE GRADUATE OF EP

<b>SOFT SKILLS.</b> Behavioral skills and personality qualities	
SS 1. Competence in managing one's own literacy	SS1.1. The ability of self-learn, self-develop and constantly update their knowledge within the chosen trajectory and in an interdisciplinary environment. SS1.2. The ability to express thoughts, feelings, facts and opinions in the professional field. SS1.3. The ability for mobility in the modern world and critical thinking.
SS 2. Language competence	SS2.1. The ability to build communication programs in the state, Russian and foreign languages. SS2.2. The ability for interpersonal social and professional communication in the conditions of intercultural communication.
SS 3. Mathematical Competence and Competence in the field of Science	SS3.1. The ability and willingness to apply the educational potential, experience and personal qualities acquired during the study of mathematical, natural science, technical disciplines at the university to solve professional problems.
SS 4. Digital competence, technological literacy	SS4.1. The ability to demonstrate and develop information literacy through the mastery and use of modern information and communication technologies in all areas of their lives and professional activities. SS4.2. The ability to use various types of information and communication technologies: Internet resources, cloud and mobile services for searching, storing, protecting and disseminating information.
SS 5. Personal, social and academic competencies	SS5.1. The ability for physical self-improvement and focus on a healthy lifestyle to ensure full-fledged social and professional activities through the methods and means of physical culture. SS5.2. The ability to social and cultural development based on the manifestation of citizenship and morality. SS5.3. The ability to build a personal educational trajectory throughout life for self-development, career growth and professional success. SS5.4. The ability to successfully interact in a variety of socio-cultural contexts during study, work, home and leisure.
SS 6. Entrepreneurial competence	SS6.1. The ability to be creative and entrepreneurial in a variety of environments. SS6.2. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, allocate resources and manage your time. SS6.3. The ability to work with consumer requests.
SS 7. Cultural awareness and ability to express yourself	SS7.1. The ability to show worldview, civil and moral positions. SS7.2. The ability to be tolerant of the traditions and culture of other peoples of the world, to have high spiritual qualities.
<b>PROFESSIONAL COMPETENCIES (HARDSKILLS).</b>	
Theoretical knowledge and practical skills specific to this field	PC 1 - to use the basic knowledge of the natural sciences, mathematics and computer science, basic facts, concepts, principles of theories related to applied mathematics and

	computer science;
	PC 2 – to solve standard tasks of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic requirements of information security.
	PC 3 – to develop algorithmic and software solutions in the field of system and application programming, mathematical, information and simulation models, to create information resources of global networks, educational content, application databases, tests and means of testing systems and tools for compliance with standards and initial requirements.
	PC 4 – to choose mathematical models, methods of computer technologies and decision support systems in scientific research, design activities, management of technological, economic, social systems and in the humanitarian fields of human activity..

### 3.1 Matrix of correlation of the results of training in the OP as a whole with the competencies being formed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11
SS1	+	+								+	+
SS2	+									+	+
SS3		+	+	+	+		+		+		
SS4			+	+	+	+	+	+	+	+	+
SS5	+	+									+
SS6		+		+	+					+	+
SS7			+	+	+	+	+	+	+		
PC1			+	+	+	+	+	+	+	+	
PC2								+		+	+
PC3			+	+	+	+	+	+	+		
PC4			+	+	+	+	+	+	+		

**3. MATRIX OF THE INFLUENCE OF DISCIPLINES ON THE FORMATION OF LEARNING OUTCOMES AND INFORMATION ABOUT LABOR INTENSITY**

	Module name	Cycle	Component	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)													
							LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11			
1	Social Sciences Module	GED	OC	History of Kazakhstan	<p><i>The purpose</i> of the discipline 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, and originality of the historical development of Kazakhstan.</p> <p><i>Contents:</i> 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. Declaration of Independence of Kazakhstan. State system, socio-political development, foreign policy and international relations. Methods and techniques of historical description for the analysis of the causes and consequences of events in the history of Kazakhstan.</p>	5	v													
2			GED	OC	Philosophy	<p><i>Purpose:</i> Formation of a holistic understanding of philosophy as a special form of knowledge of the world, its main sections, problems and</p>	5	v												

				<p>methods of studying them in the context of future professional activity. Formation of students' philosophical reflection, skills of introspection and moral self-regulation.</p> <p><i>Content.</i> The emergence of a culture of thinking. The subject and method of philosophy. Fundamentals of philosophical understanding of the world: questions of consciousness, spirit and language. Being. Ontology and metaphysics. Knowledge and creativity. Education, science, engineering and technology. 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. Philosophy of art. Society and culture. Philosophy of history. Philosophy of religion. "Mangilik El" and "Modernization of public consciousness" is a new Kazakh philosophy.</p>														
3	Module of Socio-Political Knowledge	GED	OC	Social and Political Studies	<p><i>The goal</i> - the formation of knowledge about socio-political activities, the explanation of socio-political processes and phenomena.</p> <p><i>Contents:</i> Consideration of the socio-ethical values of societies. Understanding the features of social, political, cultural, psychological institutions in the context of their role</p>	4	v											

				in the modernization of Kazakhstani society. Making decisions to resolve conflict situations in society, including professional society. Studies of political institutions and processes, methods of analysis and interpretation of ideas about politics, power, state and civil society, understand and apply the methods and techniques of sociological, comparative analysis, understand the essence and content of the political situation in the modern world. Analysis and classification of the main political institutions.														
4		GED	OC	Cultural Studies and Psychology	Purpose: the formation of scientific knowledge of history, modern trends, current problems and methods for the development of culture and psychology, the skills of a systematic 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. Values, interests, norms are the	4	v										v	

					spiritual basis. The meaning of life, professional self-determination, health. Communication of the individual and groups. Socio-psychological conflict. Models of behavior in conflict.													
5	Socio-ethnic development module	GED	UC	Ecosystem and Law	<p><i>Purpose:</i> Formation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, scientific research methods.</p> <p><i>Contents:</i> 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 safety of human life. Knowledge and observance of Kazakh law, obligations and guarantees of subjects, state regulation of public relations to ensure social progress. Application of scientific research methods.</p>	5	v	v					v					
6		BD	EC	Abai studies	<p><i>Goal:</i> Preservation of the "national code" in the project "Kazakhstan" based on the work of A. Kunanbaev</p> <p><i>Contents:</i> historical review of the history of Kazakhstan and Kazakh literature of the 19th-20th centuries. Studies of the heritage of Abai in the</p>	3	v	v										

				<p>XX-XXI centuries. Chronology of Abay's creativity.</p> <p>Abai is a great poet, ethnographer, founder of Kazakh written literature. Abay is the compiler of the Code of Laws "The Regulations of Karamola", social significance. Abai is a thinker, religious scholar, philosopher. The role of Abai in education and science, the concept of the "Whole Man".</p> <p>“Words of Edification” by Abai, epic novel by M. Auezov “The Way of Abai”. K. Tokaev "Abai and Kazakhstan in the XXI century", role, significance.</p>												
7		BD	EC	Muhtar studies	<p><i>Purpose:</i> Formation of a historical, literary understanding of the work of M. Auezov in the context of the history of literature, patriotism and cultural and spiritual position. Development of artistic thinking, skills of independent research activity.</p> <p><i>Contents:</i> Life and career of M. Auezov Semipalatinsk, Tashkent, St. Petersburg periods. The activities of M. Auezov in the magazines "Sholpan", "Abai". Publicism M. Auezov. An artistic review of the stories "Korgansyzydyn kyni", "Kyr suretteri", "Okyfan azamat", "Kokserek", the play Enlik-Kebek and the stories "Kyly zaman", "Qarash-qarash" oqirasy", the monograph "Abai Qynanbaev", epic novel "Abai Zholy".</p>	3	v	v								



8		BD	EC	Actual Problems and Modernization of National Awareness	<p>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.</p> <p>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. The fatherland is the basis of the state. Education through national sacred 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.</p>	3	v	v										
9		BD	EC	Service to Society	<p><i>The goal</i> is the formation of socially significant skills and competencies in students based on the assimilation of academic programs, carrying out socially useful activities related to the disciplines studied at the university.</p> <p><i>Content.</i> The concept and meaning of Service learning, the history of the formation and development of the</p>	3	v	v										

				concept of Service Learning. Key components of Service Learning, socially useful activities in the children's and youth environment, organization of volunteer movement in the world and Kazakhstan practice, profile orientation of Service 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.														
10		BD	EC	Foundations of Anticorruption Culture	<p><i>Purpose:</i> formation of an anti-corruption worldview, strong moral foundations of the individual, citizenship, sustainable skills of anti-corruption behavior.</p> <p><i>Content:</i> Overcoming legal nihilism, forming 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 counteract corruption. Creation of 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</p>	3	v	v										

					from its manifestations, the ability to reasonably defend one's position, and look for ways to overcome manifestations of corruption.													
11	Communication s and Physical Training module	GED	OC	Kazakh (Russian) language	<p>Purpose: the formation of communicative competence using the Kazakh (Russian) language in the socio-cultural, professional sphere and public life, improving the ability to write academic texts.</p> <p>Content: Levels A1, A2, B1, B2-1, B2-2 (B2, C1 Russian) are presented in the form of cognitive - linguoculturological complexes, consisting of spheres, topics, subtopics and typical situations of communication of the international standard: social and domestic , socio-cultural, educational and professional, modeled forms: oral and written communication, written speech works, listening. Demonstration of understanding of the language material in texts on the educational program, knowledge of terminology and development of critical thinking.</p>	10	v											
12		GED	OC	Foreign language	The goal is the formation of intercultural and communicative competence of students in the process of foreign language education at a sufficient level of A2 and a level of basic sufficiency B1. The student reaches the level B2 of the common	10	v											

				<p>European competence if the language level at the start is higher than the level B1 of the common European competence</p> <p>Content. Levels A1, A2, B1, B2 are presented in the form of cognitive-linguoculturological complexes, consisting of spheres, topics, sub-themes and typical situations of communication of the international standard: social, social, cultural, educational and professional, modeled forms: oral and written communication, written speech works, listening. Demonstration of understanding of the language material in texts on the educational program, knowledge of terminology and development of critical thinking.</p>													
13		GED	OC	Physical training	<p>Purpose: formation of social and personal competencies and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health in order to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.</p> <p>Contents: Implementation of health-improving and training programs. A complex of general developmental and special exercises. Sports (gymnastics,</p>	8	v										

				sports and outdoor games, athletics, etc.). Control and self-control in the process of training, insurance and self-insurance. Competition judging. Means of professional-applied physical training. Modern health systems: the respiratory system according to A. Strelnikova, K. Buteyko, K. Dineika, articular gymnastics according to Bubnovsky.													
14		BD	UC	Professional Kazakh (Russian) language	<p><i>Purpose:</i> the formation of communicative competence using the Kazakh (Russian) language in the socio-cultural, professional sphere and public life, improving the ability to write academic texts.</p> <p><i>Content:</i> Levels A1, A2, B1, B2-1, B2-2 (B2, C1 Russian) are presented in the form of cognitive-linguocultural complexes, consisting of spheres, themes, subthemes and typical situations of communication of the international standard: , socio-cultural, educational and professional, modeled forms: oral and written communication, written speech works, listening. Demonstration of understanding of the language material in texts on the educational program, knowledge of terminology and development of critical thinking.</p>	3	v	v									
15		BD	UC	Professionally-oriented	<i>The purpose of discipline:</i> the formation and development of	3	v	v									

				foreign language	communication skills in a foreign language, as well as language training necessary in professional activities and building business communication. <i>Content:</i> The discipline deals with the basic concepts and terms of informatics, the content of the informatics course in English; methods of annotating, summarizing and translating literature in the specialty; the use of special professionally-oriented material in the informatics lesson is discussed; analysis of texts in English is carried out; examples of the use of English in professional activities are given.													
16		GED	OC	Information and communication technologies (in English)	<i>Purpose:</i> formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies. The development of a new "digital" thinking, the acquisition of knowledge and skills in the use of modern information and communication technologies in various activities. <i>Contents:</i> introduction and architecture of computer systems. Software. Os. Human interaction with computers. Database systems. Database management. Networks and	5			v	v							v	v

					telecommunications. Cyber protection. Internet technologies. Cloud and mobile technologies. Multimedia technologies. Smart technologies. Electronic technologies. Electronic business. Electronic control.														
17	Basics of Mathematical Sciences	BD	EC	Introduction to Specialty	<p><i>Purpose:</i> to familiarize students with the concept and structure of the information society, ways of presenting information, principles of operation and organization of personal computer devices.</p> <p><i>Contents:</i> regularities in the development of informatics are considered, the connection of informatics with production, the relationship between the development of informatics and the development of other sciences, the main methods of cognition at the empirical and theoretical level are described, an analysis and assessment of modern problems and prospects for the development of informatics are given, directions of research work of the Department of Informatics are considered.</p>	4													
18		BD	EC	Fundamentals of Academic Writing	<p><i>Purpose:</i> mastering the rules for designing and creating academic content and documents used in professional activities.</p> <p><i>Content:</i> Ability to write scientific reports, articles and abstracts,</p>	4		v		v									

				correspondence and contracts, as well as research papers and essays. Features and examples from practice are studied. Experience is gained in reviewing printed publications and electronic resources, as well as protecting one's own manuscript.														
19		BD	UC	Mathematical analysis	Purpose: formation of concepts of the beginnings of mathematical analysis. Contents: The study of the limit of a sequence and a function, the geometric and physical meaning of the derivative of a function, differentiation of a function of one variable. The assimilation of methods for differentiating various functions is necessary for the further study of mathematical analysis and other mathematical disciplines. Formation of ideas about the numerous applications of differential calculus, widely used in mathematics and natural sciences.	4					v		v					v
20		BD	EC	Theory of Probability and Mathematical Statistics	<i>The purpose:</i> to study the laws of random events and random variables, properties and their main actions; elements of statistics. <i>Contents:</i> The basic concepts of probability theory are considered: axiomatics, random events. Be able to use the basic methods and methods for determining the probability of complex events, describing and	4				v	v		v					



				determining random variables, limit theorems of probability theory. Ability to calculate the probability of random events, find quantitative characteristics of random variables, solve problems of mathematical statistics. Mastering probabilistic methods in scientific research.														
21		BD	EC	Theory of Probability and Experimental Data Processing Methods	<p><i>Purpose:</i> to study the patterns of random events and random variables, properties and basic operations on them; elements of statistics.</p> <p><i>Contents:</i> The terminology of probability theory, the main causes of measurement errors are considered; types of measurement errors; elementary methods for estimating the errors of direct and indirect measurements; algorithms for data processing of indirect measurements, structural components of the data processing process on a computer; algorithms for calculating the main statistical characteristics, data processing algorithms using the least squares method, elements of regression analysis and analysis of variance.</p>	4				v	v		v					
22		BD	UC	Algebra and Geometry	<p><i>Purpose:</i> To familiarize students with the basic concepts of higher algebra and analytic geometry, the basic mathematical methods that computer science students need to know in the</p>	4					v		v					v

				<p>process of studying when studying special courses.</p> <p><i>Contents:</i> Theory of determinants. Vector calculus. Affine and Cartesian coordinate systems. Geometry of points and lines on the plane. Curves of the second order. Points, lines and planes in space. Surfaces of the second order. Matrix Algebra and Applications. Systems of equations with n-unknowns. Linear spaces. Linear transformations. Quadratic forms. Concepts about algebras. The field of complex numbers. Ring of polynomials.</p>											
23		PD	EC	<p>Computer Methods of Approximate Calculation</p> <p>The purpose: teaching methods of construction, theoretical justification, application of numerical algorithms for solving various classes of mathematical problems.</p> <p><i>Contents:</i> Solution of non-linear equations with one unknown. Solving systems of linear algebraic equations. Interpolation and approximation of functions. Numerical integration. Numerical solution of differential equations.</p>	6					v		v			v
24		PD	EC	<p>Introduction to Computational Mathematics</p> <p>The purpose of the course is to give the future specialist a certain amount of knowledge in some sections of higher mathematics, to develop mathematical intuition and the ability to use the studied mathematical</p>	6					v		v			v

					<p>methods in solving applied problems.          Contents: Introduction to the discipline of applied mathematics. Theory of errors. Systems of linear algebraic equations (SLAE). Methods for solving SLAE. iterative methods. Numerical methods for solving nonlinear algebraic equations. Function interpolation. Numerical integration. Numerical methods for solving Cauchy problems. Methods for processing experimental data.</p>													
25		BD	UC	Physics	<p><i>Purpose:</i> formation of ideas about the modern physical picture of the world and the scientific worldview.  <i>Contents:</i> Physical foundations of mechanics. Kinematics. Dynamics of a material point and translational motion of a rigid body. Dynamics of rotational motion of a rigid body. Conservation laws. Mechanical principle of relativity. Elements of the special theory of relativity. Electrostatics and direct current. Magnetic field in matter. The phenomenon of electromagnetic induction. Electromagnetic vibrations..</p>	5												v
26		BD	EC	Programming in PHP	<p><i>Purpose:</i> teaching students fluency in various ways of designing and creating various types of sites in PHP.  <i>Contents:</i> Creating variables, working with numbers, strings, booleans, documentation and creating the</p>	5												v v v

				simplest first programs. Operations and operators in PHP language (string concatenation, arithmetic and logical operators, comparison operators, conditional operators, ternary operator, switch switch reading from files). Loops of different types (loop for, while and do while). Arrays (we will consider associative and multidimensional arrays, learn how to bypass arrays in the for and foreach loop, merge arrays and compare them). Work with MySQL databases in phpMyAdmin.													
27		BD	EC	Web application development platform .NET	<p><i>Purpose:</i> study of object-oriented and component approaches to the development of application programs using the .NET platform and the C# programming language.</p> <p><i>Contents:</i> Microsoft .NET platform. Overview of architecture and features. Topic 2. Modern tools for developing Web applications. ASP.NET 1.1 and 2.0. Topic 3. XML Web Services. Technology overview. Embedded operating systems. Scope and basics of development. Development of applications for mobile devices: Smartphones, Pocket PC. Object-oriented and component approaches to the development of application programs using the .NET platform and the C# programming language.</p>	5				v	v				v		

28		BD	UC	Educational practice	The educational practice is aimed at consolidating the acquired theoretical knowledge using IT technologies and acquiring in-depth practical skills, educational experience in practice bases: at the department, in research institutes, in computer centers and associations, as well as in organizational and managerial structures. The practice is aimed at adapting to the conditions of future professional activity. Training practice is organized with a break from training sessions.	1				v	v		v				
29	Fundamentals of programming and databases	BD	UC	Algorithmization and Programming	Purpose: to familiarize students with methods for solving applied problems and their implementation in a programming language. Contents: Programming paradigms. General principles of software development. Basic concepts of imperative programming. Fundamentals of programming in the C language. Arrays in the C language. Strings and their processing. Pointers and dynamic memory. Structural data types in C language. Reference and tree data types. Organization of input/output in the C language. Threads. Files.	5					v		v		v		
30		PD	UC	Database Management System	<i>Purpose:</i> theoretical and practical training of students in the field of creation and application of database	5				v	v						v

				management systems. <i>Contents:</i> The concept of a database and DBMS. The main functions of the DBMS.. A brief overview of the DBMS. Different views of data in the database. Representation of the conceptual model by means of the DBMS data model. Means of computer-aided design Databases. Database architecture. Logical and physical levels. Software for working with modern databases. SQL language.														
31		BD	UC	Object-Oriented Programming	Purpose: preparation for the implementation of activities for the creation and application of mathematical and software tools for information systems. Content: designing information models using modern programming languages; preparing students to use modern computers and object-oriented programming technology as a tool for solving practical problems in their subject area.	5				v	v							
32		PD	EC	Programming Language C++	<i>Purpose:</i> acquisition of knowledge and skills in developing algorithms, writing programs in a high-level programming language, preparing problems for solving, debugging and obtaining results. <i>Contents:</i> General characteristics of the C++ language. Operators.	5				v	v							

					Conditional statements. Loop operators. Arrays. Structures and associations. Functions. Strings.													
33		PD	EC	High-Level Programming Languages	<p><i>Purpose:</i> To form an understanding of algorithms and data structures through the implementation of the simplest examples. Demonstrate the implementation of algorithms in the program, methods of implementation and launch.</p> <p><i>Contents:</i> The concept of the algorithm, its performers. Ways of representing algorithms. Types and properties of algorithms. Elementary basic control structures: sequence, branching, various loops (with precondition, postcondition, parametric). Types and data structures. Relationship between the concept of a data structure and an algorithm. Classification of data structures. Simple basic structures. Static data structures. One-dimensional arrays, pointers and working with strings. Multidimensional arrays and pointers. Methods for developing algorithms.</p>	5				v	v				v			
34		BD	EC	Programming Language C#	<p><i>Purpose:</i> training students in the field of object-oriented programming in C#.</p> <p><i>Contents:</i> Fundamentals of programming in C#. Console I/O. Conditional statements. Cyclic processes in C#. Classes and objects. Arrays in C#. Classes and structures.</p>	6				v	v				v			

					Creation of components. Windows applications. Forms. Menu creation.													
35		BD	EC	R Programming Language	<i>Purpose:</i> training students in the field of object-oriented programming in C#. <i>Contents:</i> Fundamentals of programming in C#. Console I/O. Conditional statements. Cyclic processes in C#. Classes and objects. Arrays in C#. Classes and structures. Creation of components. Windows applications. Forms. Menu creation.	6			v	v		v						
36		BD	EC	Programming in Python	<i>Purpose:</i> to study the possibilities of the Python programming language, <i>Contents:</i> Introduction to Python. Basic input-output operators. Variables and constants. Data types. Condition operators. Loop operators. Functions in Python. Recursion. Lists. Arrays. Tuples. The difference between tuples and lists. Graphical user interface in Python. Libraries for the graphical interface. Working with files. Using Internet resources in the Python programming language.	6				v			v				v	
37		BD	EC	Programming in Arduina	<i>Purpose:</i> Learning the basics of programming the Arduino module, mastering the pre-professional skills of a specialist in the development and creation of engineering systems. <i>Contents:</i> Basic concepts of electronics. Arduino microcontroller programming basics. Application of electronics in cybernetic and	6				v			v				v	



					embedded systems. Mobile platform design. Protection of the final project.													
38		PD	UC	Industrial practice I	The purpose of work practice I is to create conditions that allow students to acquire practical skills for independent activity and master the basics of mathematical mastery. The production practice takes place in accordance with the academic calendar. The practice takes place in scientific research institutes of the natural and mathematical direction, in computer centers and associations, as well as in organizational and managerial structures. Based on the results of the internship, the students draw up documents on the internship.	4				v	v		v					v
39	Computer Science and Methodological basics of teaching Computer Science	BD	EC	Organization and project management	<i>Purpose:</i> teaching students the basics of project management and the skills of a system organizer. <i>Content:</i> Project structuring. Preparation of project justification. Project risk management. Completion of the project. Organizational structures of a project-oriented company. Business processes in project management. Implementation of the company's strategy through projects.	6				v	v		v					
40		BD	EC	Basic Concepts and Processes of Research and Project	To acquaint students with modern methodology and technology of project management and to be aware of the place and role of project	6				v	v		v					

				Management	management in the overall system of organizational and economic knowledge; give an idea of the theory of project management organization; to form sustainable skills for solving project management problems at all stages of its life cycle development and the use of modern information technologies; to teach how to apply organizational project management tools and acquired professional knowledge and skills in practice; form the basis for further independent study of the accumulated experience and the state of program and project management in Kazakhstan and abroad.														
41		PD	EC	Methods of Teaching Computer Science	<p><i>Purpose:</i> training a methodically competent computer science teacher, learning new knowledge related to teaching computer science, acquiring skills in using information technology in teaching, identifying and developing students' abilities.</p> <p><i>Contents:</i> Methods of teaching informatics in the system of pedagogical knowledge. The system of goals and objectives of teaching computer science at school. The structure and content of teaching the basics of informatics. Propaedeutics of the basics of informatics in elementary school. Basic course of school</p>	6		v	v	v									

				informatics. Differentiated teaching of computer science at the senior level of school. Software for the course of informatics. Computer telecommunications in the system of general secondary education.														
42		PD	EC	Computer Science in Education	<p><i>Purpose:</i> - to develop a system of knowledge, skills and abilities in the field of using computer technology in education.</p> <p><i>Contents:</i> Computer technologies in science and education. Software tools in professional activity. Computer technologies in scientific research. Application of Internet technologies in professional activity Modern computer technologies in education. Distance learning models and their characteristics, advantages and disadvantages. Building a distance course program. LMS systems (on the example of Moodle): creation of a distance course, its implementation and support.</p>	6		v	v	v								
43		BD	EC	Operating systems	<p><i>The goal</i> is to acquire fundamental theoretical knowledge by students in the field of principles for constructing modern operating systems, methods for organizing computational processes, methods for developing algorithms for the interaction of application programs with the operating system and mechanisms for</p>	4			v	v								v

				<p>their implementation.</p> <p><i>Contents:</i> Appointment and functions of operating systems. Operating system architecture. Process and thread management. Memory management in operating systems. Input-output control and file systems. Distributed resource management in network operating systems. Modern operating systems..</p>														
44		BD	EC	<p>Computer Systems Architecture</p>	<p><i>Purpose:</i> Studying the principles of construction and architecture of computers; functional and structural organization of computers; architecture of computing systems;</p> <p><i>Contents:</i> Basic principles of building computing systems. Interfaces for connecting additional equipment. Organization and principles of operation of the main logical blocks of a computer system. Types of computing systems and their architectural features. Representation of information in computing systems. Organization of memory operation of computing systems. Basic principles of resource management and organization of access to these resources. Organization of calculations in computing systems.</p>	4				v	v							v
45		BD	EC	<p>Computer Systems and Networks</p>	<p><i>Purpose:</i> to study the theoretical foundations, principles of construction, organization of</p>	5			v	v								v

				<p>functioning and the possibilities of using hardware and software of computer networks, the principles of construction, characteristics and modes of operation of their main nodes and links.</p> <p><i>Contents:</i> Computer networks. Basic concepts. Classification of computer networks. The concept of a network model. The OSI network model. The concept of a protocol. Principles of work of protocols of different levels. Composition and characteristics of communication lines. Types and characteristics of cables. Cable standards. Studying the characteristics of cables. Ethernet: on twisted pair, on coaxial (thick and thin) cable. Methods of data transmission at the physical layer. Analogue modulation. Link layer protocols. Link layer transmission methods. Switching methods. The main devices designed to organize network and interconnection. Firewall. Bridge. Switch. Internet Services. Basic concepts.</p>													
46		BD	EC	Architecture of Computing Systems and Networks	<p><i>Purpose:</i> Theoretical and practical training of students in the field of information technology to such an extent that they can choose the necessary technical, algorithmic, software and technological solutions,</p>	5				v	v						v

				<p>be able to explain the principles of their functioning and use them correctly.</p> <p><i>Contents:</i> Introduction to the architecture of computing systems. Main characteristics, fields of application of computers of various classes. Functional and structural organization of the processor. Organization of memory. Functional and structural organization of input and output. Tire organization. Organization of input-output.</p>														
47		PD	EC	<p>Web Services Development (Java EE)</p> <p>The goal of the course is to provide learners with the knowledge and skills necessary to understand the current web services architecture and the technologies by which web services can be implemented, including new Java APIs and specifications such as JAX-WS (Java API for XML Web Services) and JSR-181 (Java Specification Requests 181: Web Services Metadata for the Java Platform).</p> <p><i>Contents:</i> Overview of Service Oriented Architecture (SOA) principles and Web Services. An introduction to Java web service development. WSDL is a Web Services Description Language. SOAP is a simple object access protocol. SAAJ/DOM and SOAP handlers.</p>	6											v	v	v

				JAXB - Java Architecture for XML Binding. Java code generation from WSDL. XML based web services. Web services based on EJB components. Overview of WS-standards.													
48		PD	EC	Basics of Robotics and IT Technology	<p><i>Purpose:</i> formation of students' competencies in the field of design, programming using robotic models.</p> <p><i>Contents:</i> Robotics as an applied science. Equipment for the study of robotics. Electronic and structural components of a robotic designer. Models of robots based on Lego. Software for robotic designers. Lego Mindstorms graphical programming environment. Motion programming. Sensor programming.</p>	6				v	v			v			
49		PD	EC	Automatic Control Theory	<p><i>The goal</i> is to master the theoretical foundations, methods and tools for automatic control of drives of mechatronic devices and service robots, as well as the mathematical apparatus for modeling and researching mechatronic and robotic systems.</p> <p><i>Contents:</i> Analysis of linear automatic control systems (ACS). Estimation of ACS accuracy. Methods for ensuring the required accuracy of ACS. Stability of linear ACS. Synthesis of linear ACS. Methods for ensuring the required quality of ACS functioning.</p>	6				v	v			v			

					Nonlinear automatic control systems. Analysis and synthesis of non-linear ACS.													
50		BD	EC	Artificial Intelligence System	<p><i>Purpose:</i> formation of a holistic view of the current state of the theory and practice of building intelligent systems for various purposes.</p> <p><i>Contents:</i> The history of the development of artificial intelligence. Representation of knowledge in intelligent systems. Strategies for obtaining knowledge. NL-systems. Learning the basic features of the Prolog software environment. Systems of speech communication. Visual information processing systems. Machine translation systems.</p>	6			v	v					v			
51		BD	EC	Expert Systems	<p><i>Purpose:</i> formation of knowledge about expert systems, how they use the principles of artificial intelligence and formalized knowledge of an expert to process operational information and make informed decisions in the analyzed subject area.</p> <p><i>Contents:</i> Basic definitions. Structure of Expert Systems (ES). End user interface. Basic models of knowledge representation in ES. Presentation levels and levels of detail. Methods of acquiring knowledge. Organization of Knowledge in the Working System (in the Database). Methods for finding solutions in ES. Stages of</p>	6			v	v					v			



				development of ES. Tools for the development of expert systems. Analytical platform DEDUCTOR.														
52		BD	EC	Computational mathematics based on the MathCAD package	<p><i>Purpose:</i> To introduce the principles and methods of work of the mathematical package Mathcad. To provide students with a holistic view of the use of a personal computer in a mathematics course.</p> <p><i>Contents:</i> Getting Started with Mathcad. Elementary calculations in Mathcad. Working with documents in Mathcad. Using functions in Mathcad. Plotting in Mathcad. Matrices. Determinants. Working with matrices and vectors in Mathcad. Systems of linear equations. Solution methods. Solving systems of linear equations using Mathcad. Solving arbitrary equations using Mathcad. Solving equations in Mathcad. Operations with complex numbers in Mathcad.</p>	5				v			v					v
53		BD	EC	Computational Mathematics based on the MatLab package	<p><i>Purpose:</i> to provide students with basic skills in working with computer mathematics systems, for example, MatLab, to perform calculations and conduct research in various areas of mathematics and economics.</p> <p><i>Contents:</i> Introduction. Introduction to Matlab. Matrices. Operations with matrices in MatLab. Construction of graphs on the plane and in space. Data</p>	5				v			v					v

					types. Programming in the MatLab language. Character data processing. Working with files. Symbolic calculations.													
54		BD	EC	Modern cloud technology	<p><i>Purpose:</i> Obtaining theoretical knowledge and practical skills in the architecture of "cloud" technologies, methods and features of designing "cloud" services, as well as gaining skills in developing applications for the main existing "cloud" platforms.</p> <p><i>Contents:</i> main characteristics of "cloud" technologies; main differences from solutions based on server technologies; the benefits and risks associated with the use of "cloud" computing, as well as the prerequisites for the transition to "cloud" infrastructure and the use of "cloud" services. Familiarize yourself with existing cloud-based solutions, as well as with the main providers of "cloud" platforms. Consider the structure of these services: components and how these components interact, the advantages and disadvantages of these platforms.</p>	6			v	v								v
55		BD	EC	Fundamental Cloud Technology Theory	<p><i>Purpose:</i> formation of the necessary amount of theoretical and practical knowledge about cloud computing technology, skills and abilities of the practical implementation of cloud technologies in education, studying</p>	6			v	v								v

				<p>the tools of this technology.  <i>Content:</i> familiarization with the basic concepts and terminology of cloud technologies; familiarization with the areas of application of cloud technologies; familiarization with the concept of cloud computing in relation to educational activities; familiarization with the infrastructure of cloud computing; studying the issues of security, scaling, deployment, backup in the context of cloud infrastructure; study of cloud programming methods; mastering system administration skills to develop and maintain applications deployed in the clouds.</p>													
56		PD	UC	Industrial practice -2	<p>Industrial practice is carried out in order to consolidate the theoretical knowledge gained in the learning process; acquisition of practical skills, competencies and experience in the field of training; familiarization in practice with the issues of professional activity aimed at the formation of knowledge, skills and experience of professional activity. This is an active individual form of learning, during which students develop the ability to work independently, based on individual plans and tasks. Practice is organized with a separation from training sessions for several weeks.</p>	6		v			v		v				v



					of creating Internet information resources. JavaScript language (VBScript) as a means of creating interactive resources. Multimedia as a means and technology. The main types and types of computer graphics. Digital video and audio information.													
59		PD	UC	Internet - technologies	<p><i>Purpose:</i> to form the student's ideas about the main resources of the Internet, social services; to teach technologies for creating sites using the HTML markup language, methods for creating scripts in the JavaScript programming language, taking into account the object model of document presentation; to give concepts about the physical structure of the Internet, about communication channels, routing data flows.</p> <p><i>Contents:</i> How the Internet works, types of Internet connections. Dial-up access and its features, equipment. Broadband access, its subspecies, characteristics. Wireless access, its subspecies, characteristics. Internet search basics. Email. Web page development. Web forums. Personal diaries. Alternative systems of network conferences. Web chats. Internet pagers. IRC chat system. Voice communication on the Internet. Buying and selling goods via the Internet. Electronic payment systems.</p>	5												

60				Blockchain management	<p><i>Purpose:</i> mastering the discipline is to study the blockchain technology (distributed registry) with an emphasis on its mathematical and technical foundations, as well as applied aspects.</p> <p><i>Contents:</i> Blockchain basics. Blockchain: definition, properties and examples of industrial applications. Cryptographic foundations of blockchain. Fundamentals of cryptography. Public key cryptography, RSA. ElGamal. Smart contracts. Micropayments and the Bitcoin script language. Blockchain Ethereum and smart contracts in it. Private blockchains. The current state of blockchain technology. Opportunities, limitations and challenges of the blockchain.</p>	5			v	v					v			
61		BD	EC	Fundamentals of 3D Modeling	<p><i>Purpose:</i> formation of students' stable knowledge in the field of design using 3-D modeling of the main stages of decommissioning of nuclear and radiation hazardous facilities.</p> <p><i>Contents:</i> 3D program interface. Acquaintance with the tools and methods of designing 3-D models for the project being developed. Use of various tools. Fundamentals of 3D Modeling. Standard and complex primitives. Transformation of objects. Three-dimensional modeling.</p>	5			v	v			v					

					Designing basic assembly parameters. Fundamentals of creating a three-dimensional image of mechanical and power equipment. 3D modeling of buildings and structures. Designing a three-dimensional image of buildings with life support systems and technological vehicles.														
62		BD	EC	Engineering Graphics	<p><i>Purpose:</i> formation of knowledge about the conceptual foundations of the theory of displaying objects on planes, readiness to use the theoretical provisions of computer technology in the practice of design and engineering work.</p> <p><i>Contents:</i> Making drawings. Basic rules for drawing dimensions on drawings, symbols and inscriptions. Geometric constructions. Projection methods. Axonometric projections. Geometric bodies in orthogonal and axonometric projections. Development of surfaces of geometric bodies. Section of geometric bodies by planes. Basic information about design documentation.</p>	5					v	v				v			
63		BD	EC	Development and Use of Mobile Applications	<p><i>Purpose:</i> formation of competencies in the field of design and implementation of enterprise IT infrastructure components that ensure the achievement of strategic goals and support for business processes based on mobile technologies.</p>	5											v	v	v

					<p><i>Contents:</i> Introduction to mobile application development. Types of applications and their structure. Fundamentals of mobile application interface development. Fundamentals of developing multi-window applications. Using the capabilities of a smartphone in applications. Using libraries. Work with databases, graphics and animation. Game development.</p>													
64		BD	EC	New Information Technologies in Education	<p><i>Purpose:</i> development of fixed assets of modern information technologies and methods of their application in educational activities.</p> <p><i>Contents:</i> Possibilities of information technology (IT) tools for solving problems in professional activities. Technical and software tools for the implementation of information processes (IP). Computer tools for working with text and graphic information. Information technology tools for structuring and organizing data. Distributed information processing. Organization of computer information systems for scientific and educational programs.</p>	5			v	v		v						
65		BD	EC	Subjects on the additional	<p><i>The goal</i> of the Minor program is to provide students with an additional in-</p>	12			v	v								v



	Module of new professional competencies acquisition			educational program	depth education in the field of computer science. The objectives of the program are to prepare bachelors of natural science who are able to solve problems from a set of disciplines and (or) modules and other types of educational work determined by the student in order to form additional competencies in the field of computer science and information technology.														
66	Module of final certification	PD	UC	Pre-degree practice	Consolidation of knowledge and skills acquired by students during the entire training period. Acquisition of practical experience, skills of independent research work. Collection, systematization, generalization of materials for the preparation of the final qualifying work (FQW). The study of special literature on the topic of FQW. Conducting research on the topic of FQW. Development of software implementations of algorithms and modules on the topic of FQW.	10			v	v	v	v						v	
67				Writing and defending a thesis (project) or preparing and passing a comprehensive exam	To achieve the goals of the thesis, the graduate solves the following tasks: explores regulatory legal acts, scientific and methodological literature of domestic and foreign authors for the theoretical substantiation of the essence of the problem under study; collects, summarizes and analyzes specific data	8													

					on the subject of work in accordance with the subject of the thesis. In conclusion, the design and defense of the dissertation.														
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### 5. Summary table on the volume of loans disbursed in the context of EP modules

Course	semester	Number of modules to be mastered	Number of subjects studied			Number of credits KZ						Total in hours	Total loans KZ	Quantity	
			OC	UC	EC	Theoretical training	Physical Culture	Educational practice	Production practice	Pedagogical practice	Final certification			exam	differential credit
1	1	4	5	1	1	28	2					900	30	6	1
	2	4	4	1	2	27	2	1				900	30	5	2
2	3	6	2	3	3	28	2					900	30	6	2
	4	5	1	5	1	24	2		4			900	30	5	2
3	5	5	1	-	5	30						900	30	5	1
	6	3		1	3	24			6			900	30	2	1
4	7	3		1	3	21						630	21	4	
	8	3			4	21						630	21	4	
	9	1		1						10	8	540	18		
<b>Итого</b>		<b>10</b>	<b>8</b>	<b>13</b>	<b>22</b>	<b>203</b>	<b>8</b>	<b>1</b>	<b>10</b>	<b>10</b>	<b>8</b>	<b>7200</b>	<b>240</b>	<b>37</b>	<b>9</b>

## 6. LEARNING STRATEGIES AND METHODS, MONITORING AND EVALUATION

<p><b>Learning strategies</b></p>	<p><b>Student-centered learning:</b> The student is the center of teaching/learning and an active participant in the learning and decision-making process.</p> <p><b>Practice-oriented training:</b> orientation to the development of practical skills.</p>
<p><b>Teaching methods</b></p>	<p>Conducting lectures, seminars, various types of practices:</p> <ul style="list-style-type: none"> <li>• using innovative technologies:             <ul style="list-style-type: none"> <li>• problem-based learning;</li> <li>• case study;</li> <li>• work in a group and creative groups;</li> <li>• discussions and dialogues, intellectual games, olympiads, quizzes;</li> <li>• reflection methods, projects, benchmarking;</li> <li>• Bloom's taxonomies;</li> <li>• presentations;</li> <li>• rational and creative use of information sources:</li> <li>• multimedia training programs;</li> <li>• •electronic textbooks;</li> <li>• digital resources.</li> </ul> </li> </ul> <p>Organization of independent work of students, individual consultations.</p>
<p><b>Monitoring and evaluation of the achievability of learning outcomes</b></p>	<p><b>Current control</b> on each topic of the discipline, control of knowledge in classroom and extracurricular classes (<i>according to syllabus</i>). Assessment forms:</p> <ul style="list-style-type: none"> <li>• survey in the classroom;</li> <li>• testing on the topics of the discipline;</li> <li>• control works;</li> <li>• protection of independent creative works;</li> <li>• discussions;</li> <li>• trainings;</li> <li>• colloquiums;</li> <li>• essays, etc.</li> </ul> <p><b>Boundary control</b> at least twice during one academic period within the framework of one academic discipline.</p> <p><b>Intermediate certification</b> is carried out in accordance with the working curriculum, academic calendar.</p> <p>Forms of holding:</p> <ul style="list-style-type: none"> <li>• exam in the form of testing;</li> <li>• oral examination;</li> <li>• written exam;</li> <li>• combined exam;</li> <li>• project protection;</li> <li>• protection of practice reports.</li> </ul> <p><b>Final state certification.</b></p>


## EDUCATIONAL AND RESOURCE SUPPORT OF THE EP

<p><b>Educational Information Center</b></p>	<p>There are 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC) in the structure of the EIC. The network infrastructure of the EIC is based on 180 computers with Internet access, 110 automated work places, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4, 3 format scanners. EIC software - AIBS "IRBIS-64" under MS Windows (basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system.</p> <p>The library fund is reflected in the electronic catalog available to users on the site <a href="http://lib.ukgu.kz">http://lib.ukgu.kz</a> on-line 24 hours 7 days a week.</p> <p>Thematic databases of their own generation have been created: "Almamater", "Proceedings of SKSU scientists", "Electronic archive". Online access from any device in 24/7 mode via an external link <a href="http://articles.ukgu.kz/ru/ppp">http://articles.ukgu.kz/ru/ppp</a>.</p> <p>Working with catalogs in electronic form. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKGU in Print", "Readers", "SKR".</p> <p>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 in the EIC subdivisions; through the information network of the university for faculties and departments; remotely on the library website <a href="http://lib.ukgu.kz/">http://lib.ukgu.kz/</a>.</p> <p>Open access to international and republican resources: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in the public domain, "Zan", "RMEB", "Adebiet", Digital library "Aknurpress", "Smart-kitap", "Kitap.kz", etc.</p> <p>For people with special needs and disabilities, the library website has been adapted to the work of visually impaired users.</p>
<p><b>Material and technical base</b></p>	<p>The material and technical base of the Department of Informatics includes the following classrooms and computer classes for undergraduate students:</p> <ul style="list-style-type: none"> <li>- there are 3 computer classes for laboratory work, one of them with an interactive whiteboard;</li> <li>- lecture halls;</li> <li>- STEM center.</li> </ul> <p><i>Practice bases for students</i></p> <ol style="list-style-type: none"> <li>1. Gymnasium school No. 26 named after Zhambyl, Shymkent</li> <li>2. SMCE "Higher College of New Technologies" named after Manap Utebayev"</li> <li>3. Water Resources-Marketing LLP</li> <li>4. KazTilDamu LLP</li> <li>5. South Kazakhstan College of Humanities and Economics</li> <li>6. M. Auezov SKU, laboratory "Mechatronics and Robotics"</li> <li>7. "Alem" Printing House</li> </ol>

## APPROVAL SHEET

on Education Program «6B06110 – Computer science»

Director of DAA

  
\_\_\_\_\_  
Naukenova A.S.

Director of DAsc

  
\_\_\_\_\_  
Nazarbek U.B.

Director of DE&C

  
\_\_\_\_\_  
Bazhirov T.S.

## **REVIEW**

on the educational program  
6B06110 - "Computer science",

developed in M. Auezov SKU, Shymkent

### **1. Brief description of the enterprise and its business profile**

RSE M. Auezov South Kazakhstan University is a leading multidisciplinary university in the Turkestan region. In the structure of the university there is a Natural Science and Pedagogical Higher School, on the basis of which the proposed EP is supposed to be implemented. The department "Computer science" is determined responsible for the implementation of EP.

### **2. The relevance and demand for EP**

The training of specialists in the educational program 6B06110- " Computer science " is very relevant in the light of the further development of the field of information and communication technologies in the framework of the program "Digital Kazakhstan". Its focus on meeting current and future needs for highly qualified specialists in information technology will undoubtedly contribute to the development of the economy due to the wide use of modern scientific and technological progress in the field of modeling various processes and the use of information technologies, informatization and automation of production management and business functions.

### **3. Learning outcomes and competencies, their relationship with the demands of the labor market**

The results of training and competence laid down in EP, the provided theoretical knowledge, practical skills and professional skills fully comply with modern qualification requirements for bachelor qualifications specialists.

### **4. Availability of components that develop practical skills**

Academic disciplines of educational program of basic and specialized training provide the formation of the necessary practical skills of a specialist with fundamental knowledge in mathematics, possessing computer methods of collecting, storing and processing information used in his professional activities, able to assess the perspective of the methods used to solve tasks, competitive in the domestic and international labor markets.

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

The proposed educational program contains all the necessary elements for the effective organization of the educational process - it regulates the objectives, expected results, content, conditions and technologies for the implementation of the educational process, assessment of the quality of training a specialist with a bachelor's degree. Includes curriculum, work programs of training courses, modules and disciplines, related materials: practical training programs, academic calendar, educational and methodical complexes of disciplines.

The content of the curriculum is fully consistent with the focus of training, thought out and competently staffed with content. The disciplines included in the plan cover the whole range of

topical issues and problems according to the profile of training, are fully capable of forming the necessary specialized knowledge, skills and abilities in the field of information technologies.

The distribution of disciplines by study periods is rationally and logically verified. There are all kinds of educational activities for the preparation of highly qualified specialists possessing the skills of research work - theoretical training, work experience, writing and defense of the thesis. 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 mandatory academic disciplines, as well as disciplines of the university component and an optional component. Compulsory disciplines provide the formation of general and professional competencies. The disciplines of the university component and the component of choice expand and deepen the training of students, contribute to obtaining additional competencies, knowledge and skills necessary to ensure the graduate's competitiveness with the requirements of the labor market.

## **6. The quality of filling information about the disciplines**

The composition of educational modules covers all relevant areas of training specialists in the field of information technology. The content of the table "Information about disciplines" of the educational program includes the following information: module name, cycle, type of discipline, name of the discipline and its brief description, number of credits, codes of learning outcomes, and also correspond to the adopted competence model of the graduate.

## **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 correspond to the modern qualification requirements of training bachelors specializing in information technology in the educational program 6B06110-“Computer Science”

Head of the Department of Informatics and Mathematics  
A. Kuatbekov University of Friendship of Peoples,  
Candidate of Technical Sciences

M.A. Amandikov



## **Expert conclusion**

on the educational program  
6B06110 - "Computer Science"

### **1. The relevance of the EP**

The development of information and telecommunication technologies is impossible without appropriate staffing. The relevance of the educational program is due to the need to prepare bachelor-informatics for the southern region and neighboring countries. This EP corresponds to the updated content of secondary education in Kazakhstan, i.e. is aimed at successful student learning and is based on expected results, which are determined by educational areas and reflect the student's ability to find and apply knowledge to solve practical problems.

### **2. Compliance of EP with formulated objectives, consistent with the mission of the university, the needs of employers and students**

The educational program 6B06110 - "Computer Science" formulates the concept of the educational program, the goals and objectives of training, the requirements for the organization of the educational process and the applicants, the learning outcomes of the EP, and also describes the qualification characteristics of the graduate of the educational program, its key and professional competencies, information about disciplines. The list of academic disciplines and their content meets the current qualification requirements for specialists in the areas of information technology and computer science.

The selection of academic disciplines, the requirements laid down in relation to the formed knowledge, practical skills and professional competencies are fully consistent with the mission of the university "Forming the country's intellectual elite through generating new knowledge and transforming the university into a entrepreneurial university", meet the needs of employers and students.

### **3. Compliance with the National Framework of Qualifications of the Republic of Kazakhstan**

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

### **4. Reflection in the OP of learning outcomes and competencies based on Dublin descriptors laid down in professional standards / industry framework**

The OP is harmonized with the Dublin descriptors, the 1st cycle of the Qualifications Framework for the European Higher Education Area (A Framework for the European Higher Education Area), and also the 6th level of the European Qualifications Framework for Lifelong Learning.

### **5. Compliance with the classification of training areas with higher education**

The educational program corresponds to the direction 6B061-ICT of the classifier areas of training staff with higher education.

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

In accordance with the credit technology of education in the EP, a modular construction principle is laid. The curriculum includes disciplines of the university component and disciplines of the component of choice. The disciplines of the university component ensure the formation of general and professional competencies. Elective component disciplines broaden and deepen the training of students, contribute to obtaining additional competencies, knowledge and skills necessary to ensure the graduates' competitiveness with the requirements of the labor market.

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

## **7. The presence in the OP of components to prepare for professional activities, 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 content of the EP corresponds to the focus of training, thought out and well-equipped with meaningful content. The included academic disciplines cover the whole range of topical issues and problems and problems according to the profile of training, are fully able to form the necessary specialized knowledge, skills and abilities of information technologies, suggest mastering Kazakh, Russian and English languages.

## **8. The logical sequence of disciplines and the reflection of the basic requirements in the curricula and training programs**

The distribution of disciplines by study periods is rationally and logically verified. There are all kinds of educational activities for the preparation of highly qualified specialists possessing the skills of research work - theoretical training, work experience, writing and defense of the diploma work. The planned volume and time resource for academic disciplines and types of training meet the qualification requirements for the level of graduates.

Structural parts of the educational program are interconnected, successive, aimed at achieving the planned comprehensive result and are disclosed deeply and in full.

The methodological equipment of the educational program contributes to the successful solution of tasks for the key directions of training, education and development of students.

## **9. Reflection in the EP of the system of accounting of 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 the part of accounting for the academic load of teachers and students in credits. Provides 244 credit.

## **10. Presence in programs of industrial practice for fixing the theoretical material expressed in the academic load in credits**

The educational program provides for conducting the following types of practices: study practice in the amount of 1 credits, production practice I in the amount of 3 credit, production practice II in the amount of 3 credits, teaching practice in the amount of 4 credits and pre-diploma practice in the amount of 8 credits.

## **11. Qualifications obtained as a result of the mastering of EP**

For the mastering of the EP, a graduate is awarded a bachelor's degree in the field of Computer Science in the educational program 6B06110 - "Computer Science".

## **12. Recommendations**

In accordance with the above, it is possible to assert that the goals and content of the EP correspond to the modern requirements for the training of bachelors specializing in information and communication technologies.

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

Expert,  
Candidate of Physics and Mathematics,  
Ass. Professor of the Department of  
the Medical Biophysics and  
the Information Technologies  
of the JSC SKMA

M.B. Ivanova