MINISTRY OF SCIENCES AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN
M.O. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED BY»
Acting Chairman of the Board-Rector
_ _____ K. Nurmanbetov
«___»_____2024y.

EDUCATION PROGRAMME

6B06130– Computer engineering and software

Registration number	6B06100077
Code and classification of the field of education	6B06-Information and communication technologies
Code and classification of training areas	6B061-Information and communication technologies
Group of educational programs	B057- Information technologies
Type of EP	current
ISCE level	6
NQF level	6
IQF level	6
Language learning	Kazakh, Russian, English
The complexity ofEP	240 credits
Distinctive features of EP	-
University Partner (JEP)	-
University Partner (DDEP)	-

Shymkent, 2024y.

Drafters:

Name	Position	Sign
SabiraT. Akhmetova	Candidate of phys-math. sciences, associate professor, Head of chair "Computer engineering and software"	
Nurzhamal N. Dausheyeva	Candidate of technical sciences, senior lecturer	
Olzhas A. Zhantassov	Lecturer	
Student's name	**group**	
Bektemisov Abai	IP-21-6r	
Sailau Dariga	IP-21-6k2	
Employer's name		
Kayrat P. Dzhumagaliev	Head of the Department of JSC "National Information Technologies"	
ZhandosM. Zhunisov	Director of «KazMBS» LP	
Aleksandr A. Pavlov	Director of "Digital Systems" LP	
Murod I. Akmalov	Director of "KomSity Shymkent" LP	
Aleksandr V. Gatsko	Director of "ART Technology" LP	

The EP was considered in the direction of training "Information and communication technologies and telecommunications" at a meeting of the academic committee, Minutes # ___ «_____» _____ 2024 y.

Chairman of the Committee _____ E. Shertaev
                                                        Sign

The EP was considered and recommended for approval at Educational-methodical meeting of   M. Auezov SKU.
Minutes # ___ «_____» _____ 2024 y.

Chairman of the EMM   _____ K. Sarykulov
                                                        Sign

The EP was approved by the decision of the Academic Council of the University.
Minutes # ___ «_____» _____ 2024 y.

CONTENT

1. CONCEPT OF THE PROGRAM

University Mission	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 in rapidly changing conditions. • 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.
The uniqueness of the educational program	• Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders • Practical orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow to be functionally literate and competitive in any life situation and be in demand in the labor market
Academic Integrity and Ethics Policy	The university has taken measures to maintain academic integrity and academic freedom, protection from any type of intolerance and discrimination: • Rules of academic integrity (order No. 212 of October 10, 2022); • Anti-corruption standard (order No. 221 n/a dated 12/07/2021). • Code of Ethics (Order No. 212 of October 10, 2022)
Regulatory and legal framework for the development of EP	1. Law of the Republic of Kazakhstan "On Education"; 2. Model rules for the activities 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 3. Standard rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 600 with amendments and additions dated 06/02/2023. No. 252 4. State mandatory standards for higher and postgraduate education, approved by order of the Ministry of Education and Science of July 20, 2022 No. 2; 5. Rules for organizing the educational process in credit technology of education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152; with changes and additions from 09/23/2022. No. 79 6. Qualification reference book for 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.

7. Methodological recommendations for introducing ECTS principles into the educational process and expanding academic freedom. Appendix to the order of the Minister of Science and Higher Education. of the Republic of Kazakhstan dated February 12, 2024 No. 57

8. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the National Center for the Development of Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan dated May 4, 2023 No. 601 n/k

Organization of the educational process	• Implementation of the principles of the Bologna Process • Student-centered learning • Availability • Inclusivity
Quality assurance of the Educational program	• Internal quality assurance system • Involvement of stakeholders in the development of the Educational Program and its evaluation • Systematic monitoring • Actualization of the content (updating)
Requirements for applicants	They are established in accordance with 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 October 31, 2018, with changes and additions dated June 2, 2023. No. 252
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.

1. PASSPORT of the Educational program

Purpose of the EP	Training of practice-oriented, stable in the labor market IT specialists with research thinking and culture for relevant areas of science, industry, technology based on the competence-based approach of fundamental education, which allows solving the problems of digitalization of the economy.
Tasks of the EP	• formation of socially responsible behavior in society, an understanding of the significance of professional ethical norms and adherence to these norms; • providing basic undergraduate training that allows you to continue learning throughout life, to successfully adapt to changing conditions throughout their professional career; • providing conditions for acquiring a high general intellectual level of development, mastering literate and developed speech, a culture of thinking and the skills of scientific organization of work in the field of information and communication technologies; • creation of conditions for intellectual, physical, spiritual, aesthetic development to ensure the possibility of their employment in the specialty or continuing education at subsequent levels of education. • Establishing conditions for the development of in-demand knowledge and skills, as well as a conscious attitude towards enhancing the welfare of society and conserving the planet within the framework of the SDGs.
Harmonization of EP	• 6th level of the National Qualifications Framework of the Republic of Kazakhstan; • Dublin descriptors of the 6th level of qualification; • 1 cycle of a Framework for Qualification of the European Higher Education Area); • 6th Level of European Qualification Framework for Life long Learning).
Connection of the EP with the professional sphere	1. Sectoral qualifications framework, approved by the Minutes of the Session of the Sectoral Commission in the field of information, informatization, communications and telecommunications on December 20, 2016 № 1. 2. Professional standard "Software Development". Appendix No. 7 to the order of the Acting Chairman of the Board of NCE RK "Atameken" No. 222 dated 05.12.2022.; 3. Professional standard "Software Testing". Appendix No. 22 to the order of the Acting Chairman of the Board of NCE RK "Atameken" No. 222 dated 05.12.2022.; 4. Professional standard "Development of artificial intelligence applications". Appendix No. 17 to the order of the Acting Chairman of the Board of NCE RK "Atameken" No. 222 dated 05.12.2022.; Professional Standard "Graphic and multimedia design development". 5. Professional standard "Development of big data processing and storage systems". Appendix No. 18 to the order of the Acting Chairman of the Board of NCE RK "Atameken" No. 222 dated 5.12.2022.; 6. Professional standard "Database Administration". Appendix No. 1k to the order of the Acting Chairman of the Board of NCE RK "Atameken" No. 222 dated 05.12.2022.; 7. Professional standards. Appendix № 43 to the Order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" №259 on December 24, 2019

	Professional Standard "Software developers and specialists in testing, WEB and multimedia applications". Professional standard "Forensic examination of computer technology tools". Appendix 3 to the Order of the Minister of Justice of the Republic of Kazakhstan dated 23.01.24 No. 60
Name of the degree awarded	After the successful completion of this EP, the graduate is awarded the degree: "Bachelor in the field of information and communication technologies in the EP "6B06130 - Computer engineering and software".
List of qualifications and positions	Bachelors in the specialty 6B06130 - Computer Engineering and Software can hold primary positions as a software engineer, programmer, software maintenance specialist, software designer without qualifying work experience in accordance with the qualification requirements of the Qualification directory 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 on December 30, 2020 № 553
Field of professional activity	The scope of professional activity of graduates are public and private enterprises and organizations that develop, implement, use computers and software information and communication systems in various fields of economic activity. The field of professional activity of graduates is the research, development, testing, implementation and maintenance of information and communication systems
Objects of professional activity	The objects of professional activity of graduates who have mastered the undergraduate program in the direction of - Information and communication technologies are information processes, computer systems for information processing and management, technologies, systems and networks, their instrumental (program, technical, organizational) software, methods and methods of design, production and operating information and communication systems.
Subjects of professional activity	• computers, complexes, systems and networks; • computer systems for information processing and management; • computer-aided design systems; • software of computer equipment and information systems (programs, software systems and information systems).
Types of professional activity	• analysis of software requirements for information and communication systems; • design software and hardware for information and communication systems; • operation of operating systems and operation of information and communication systems; • software implementation of development systems tasks; • administration of systems and computer networks; • testing software systems; • maintenance, technical support of software systems; • integration of software modules and software components; • provision of software and hardware protection; • commercialization of ICT services.
Learning outcomes	**LO1** Demonstrates the ability to communicate in any format in a multilingual environment, willingness to participate in the industrialization of the economy through the implementation of innovations and the development of infrastructure in the field of

	information and communication technologies; **LO2** Demonstrates natural science, mathematical, socio-economic, engineering knowledge and practices methods of mathematical, structural analysis, modeling and forecasting, experimental and expert research skills in his professional activity; **LO3** Analyzes the requirements for the design of software and hardware: intelligent systems, computer networks, databases, web applications, information security conditions, user documentation, operation and maintenance; **LO4** Argues for the choice of basic standards, principles and design patterns, methods, tools of programming languages for software development, network components, web resource platforms, software applications based on system analysis, modern ICT and information security tools; **LO5** It is able to transform software requirements into an architecture that defines the structure of software and hardware and the composition of its components, describes these components and the interfaces between them, for their subsequent coding and testing in modern programming languages; **LO6** Applies, in accordance with the principles of optimality, methods and tools for developing software interfaces, database models, organization and structuring of data and computing processes, principles of information and network security; **LO7** Applies methods of algorithm construction, software lifecycle, uses tools and tools of modern object programming languages with standard sets of libraries in different environments and the specifics of implementation in multitasking software, the functionality of intelligent systems, as well as regulations for updating software versions and migrating databases to new platforms, technologies to improve usability; **LO8** Manages the coding process in programming languages based on optimal data structures, settings of development tools and performs testing of each software component, applications and databases, debugging, code expertise, maintenance and consulting of users of system and application software, generation of reports on the results; **LO9** Integrates software components based on the procedures for assembling software modules and converting (converting) data, generates relevant information from extracted data, creates SQL queries to the database, Big Date, evaluates software for compliance with the required quality criteria; **LO10** Develops instructions for working with programs, documentation of software and database software interfaces, and determines the possibility of using and adapts ready-made software products; **LO11** Demonstrates creative thinking, responsibility for consumption and production, skills in organizing partnerships for sustainable development at all phases of designing and implementing digital solutions using logical, systematic approaches.

3. Competencies of an EP graduate

SOFTSKILLS. Behavioral skills and personality qualities	
SS1. Competence in managing one's literacy	SS1.1. The ability to self-study, self-develop and constantly update their knowledge within the chosen trajectory and in an interdisciplinary environment. SS1.2. Ability to express thoughts, feelings, facts and opinions in the professional sphere. SS1.3. The ability to 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 to interpersonal social and professional communication in the context 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 the search, storage, protection and dissemination of information.
SS 5. Personal, social and educational competencies	SS5.1. The ability to physically improve oneself and focus on a healthy lifestyle, to ensure successful social and professional activities. 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.
GC 6. Entrepreneurial competence	SS6.1. The ability to be creative and enterprising in different environments. SS6.2. Ability to work in the mode of uncertainty and rapid change of task conditions, make decisions, allocate resources and manage your time. SS6.3. Ability to work with consumer requests.
SS 7. Culturalawarenessandability toexpressyourself	SS7.1. Ability to show ideological, civic and moral positions. SS7.2. The ability to be tolerant to the traditions and culture of other peoples of the world, to possess high spiritual qualities.
HARDSKILLS	
Theoretical knowledge and practical skills specific to this field	HS1. Analyzes requirements, identifies problems, goals and applies software design methodologies, programming tools, evaluates the functionality of software, intelligent systems using system simulation, mathematical logic, probabilistic models, their formalization based on standards, principles, templates.
	HS2. It is able to analyze and select algorithms, programming language, Web development tools, mobile applications, optimal data structures, UML, interfaces for architecture visualization, logical inference algorithms based on knowledge in the development of PAO systems, including intelligent ones, to obtain an adequate result taking into account

	economic efficiency and required quality criteria.
	HS3. Demonstrates knowledge and ability to perform procedures for assembling software modules and software components into a program in modern operating systems and programming environments, create basic GI elements, test and debug program code, describe interfaces at the level of inter-module interactions, choose a way to update, restore the OS and interact with the environment.
	HS4. He knows and applies the laws of information theory, coding for practical tasks, has the skills to solve and implement special organizational, software and hardware information security tools, implements a policy of protecting information and communication systems.
	HS5. Analyzes and applies methods of synthesis of electronic circuits, calculates elements of digital devices taking into account modern trends in development and architecture, organization of computing cluster systems and networks, distinguishes the logical and physical structure of computer networks and rules of network interaction.
	HS6. He knows the basics of designing artificial intelligence systems, uses logical inference algorithms based on knowledge, applies classification methods into groups based on BigData features, and is able to present tasks in a formalized language.
	HS7. Designs and puts into practice database schemas, standard databases, data structuring, complex SQL query development and applies query optimization methods, storing and reading data from DBMS, BigDate repositories, analyzes events when using the database, uses criteria for searching, classifying and extracting relevant data.
	HS8. Selects methods, programming technologies, principles of software migration to another object-based programmable environment and software performance testing tools, applies logic programming algorithms, utilities and is able to develop application programs in C++, C# for subsequent use.
	HS9. Demonstrates the skills of working in graphical software environments, analysis and evaluation, expertise of the architecture of mobile applications, uses Internet technologies, web development, knowledge of protocols, software controllers.
	HS10. He is able to take responsibility for the result when implementing information system software, for his own safety and the safety of others, customize for a specific user, carry out strategic project management, result-oriented.

3.1 Matrix for correlating learning outcomes in the EP as a whole with the competencies being developed

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
GC1	✓				✓					✓	
GC2	✓	✓								✓	
GC3		✓		✓							✓
GC4	✓			✓							
GC5			✓			✓					✓
GC6		✓		✓				✓	✓		
GC7				✓		✓					✓
PC1		✓	✓						✓		
PC2			✓	✓			✓		✓		
PC3				✓	✓			✓	✓		
PC4						✓		✓	✓		
PC5		✓	✓	✓		✓					
PC6				✓		✓	✓			✓	
PC7			✓			✓		✓			✓
PC8				✓	✓		✓	✓		✓	
PC9			✓	✓			✓	✓			
PC10		✓		✓				✓			✓

4.　Matrix of the influence of modules and disciplines on the formation of learning outcomes and information on labor intensity

№	Module name	Cycle	UC/CC	Component Name	Brief course description	Number of credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
							Formed LO(codes)										
1	Fundumentals of the Public Sciences	GED	OC	History of Kazakhstan	**Purpose:** 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. **Content:** Ancient people and the formation of 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 of the Republic of Kazakhstan. Methods and techniques of historical description for the analysis of the causes and consequences of events in the history of Kazakhstan.	5	✓	✓	✓								
		GED	OC	Philosophy	**Purpose:** The formation of a holistic idea among students about philosophy as a special form of knowledge of the world, about its main sections, problems and methods of studying them in the context of future professional activity. And also the formation of philosophical reflection, introspection and moral self-regulation among students. **Contents:** Emergence of a culture of thinking. Subject and method of philosophy. Fundamentals of philosophical understanding of the world: questions of consciousness, spirit and language. Being. Ontology and metaphysics. Cognition and creativity. Education, science, technology and technology. Human philosophy 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.	5	✓	✓	✓								

№	Discipline group	Cycle	Comp.	Discipline name	Description	Cr.												
					Society and culture. Philosophy of history. Philosophy of religion. "Mangilik El" and "Modernization of Public Consciousness" are a new Kazakhstan philosophy													
2	Socio-Political knowledges	GED	OC	Social and Political Studies	**Purpose:** forming knowledge about social and political activities, explaining social and political processes and phenomena. **Content:** Consideration of the system of socio-ethical values of the society. Ways to use social, political, cultural, psychological institutions, features of youth policy in the modernization of Kazakhstani society and solve conflict situations in society and professional environment based on them. To study the methods of analysis and interpretation of political institutions and processes, ideas about politics, power, state and civil society, to understand and use the methods and methods of sociological, comparative analysis, to understand the meaning 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 basics of the morphology of culture are studied, the characteristic of the anatomy of culture is given and its semiotic character is revealed. **Content:** the ideas about the archaic culture on the territory of ancient Kazakhstan are given, the main stages of the formation of Kazakh culture are considered, the essence of Kazakh culture in the context of modern world processes is revealed and an idea of the basics of Kazakhstan's cultural policy is given.	4	✓	✓	✓									
3	Socio-ethnic Development	GED	HsC	Ecosystem and Law	**Purpose:** Formation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, scientific research methods. **Content:** Fundamentals of safe human-nature interaction, ecosystem and biosphere productivity. The entrepreneurial activity of society 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.	5		✓	✓			✓						

					Knowledge and compliance of Kazakhstan's law, obligations and guarantees of subjects, state regulation of public relations to ensure social progress. Application of scientific research methods.														
	BD	EC	Basics of Financial Literacy		**Purpose:** to study personal and family financial resources, which are critical to achieving financial well-being. **Content:** Financial planning and consumer safety. Basic methods and techniques for effective spending and saving money. Protecting and investing your own financial resources. The role and significance of personal finance, its capabilities for achieving financial stability. Filtering out a lot of dubious financial information. Incentives for independent management of responsibilities and optimal financial capabilities of the consumer. Making smart financial decisions when building a professional career.	3	✓	✓											✓
			Abay Studies		**Purpose:** based on the creativity of A.Kunanbayev, the preservation of the «national code» and in the project «Kazakhtanu» **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.Auyezova «The Way of Abai» . K. Tokayev «Abai and Kazakhstan in the XXI century», role, significance.		✓	✓											✓
			Mukhtar Studies		**Purpose:** Formation of 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".													
				✓	Service to Society	**Purpose:** 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. **Content.** The concept and meaning of Service learning, the history of the formation and development of the 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.	✓	✓									✓
				✓	Foundations of Anticorruption Culture	**Purpose:** formation of an anti-corruption worldview, strong moral foundations of a personality, civic position, stable skills of anti-corruption behavior. **Content:** Overcoming legal nihilism, formation of the basics of students' legal culture in the field of anti-corruption legislation. Formation of a conscious perception/attitude towards corruption. Moral rejection of corrupt behaviour, corrupt morality and ethics. Development of skills necessary to fight corruption. Development of anti-corruption standards of conduct. Anticorruption propaganda, dissemination of lawfulness and respect for the law. Activities aimed at understanding the nature of corruption, awareness of social damage caused by its manifestation, ability to defend one's position with arguments, seeking ways to	✓	✓									✓

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№	Module			Discipline	Description	Credits													
					overcome manifestation of corruption.														
4	Communication and Physical Training module	GED	OC	Kazakh (Russian) language	**Purpose:** formation of communicative competence using the Kazakh (Russian) language in the socio-cultural, professional and public life, improvement of the ability to write academic texts. **Content**. Levels A1, A2, B1, B2-1, B2-2 (B2, C1 Russian language) are presented in the form of cognitive-linguocultural complexes, consisting of spheres, themes, sub-themes and typical situations of communication of the international standard: social, social - cultural, educational and professional, modeled by forms: oral and written communication, written speech works, listening. Demonstration of understanding of the language material in the texts on the educational program, knowledge of terminology and development of critical thinking.	10	✓			✓					✓			✓
		GED	OC	Foreign Language	**Purpose:** formation of students' intercultural and communicative competence in the process of foreign language education at a sufficient level A2 and a level of basic sufficiency B1. Student reaches B2level of common European competence if the language level at the start is higher than B1level of common European competence **Content:** Levels A1, A2, B1, B2 are presented in the form of cognitive-linguocultural complexes, consisting of spheres, themes, sub-themes and typical situations of international standard'scommunication: social, social - cultural, educational and professional, modeled by forms: oral and written communication, written speech works, listening.Demonstration of language material'sunderstanding in texts on educational program, knowledge of terminology and critical thinking development.	10	✓		✓		✓						✓	
		GED	OC	Physical training	**Purpose:** the formation of social and personal competencies and the ability to purposefully use the means and methods of physical culture that ensure the preservation and strengthening of health in preparation for professional activity; to the persistent transfer of physical exertion, neuropsychic stresses and adverse	8	✓											

				Course	Description		Competencies
					factors in future work. **Content:** Implementation of physical culture and health and training programs. A complex of general development and special exercises. Sports (gymnastics, sports and outdoor games, athletics, etc.). Control and self-control during classes, insurance and self-insurance. Refereeing competitions, Means of professionally applied physical training. Modern health-improving systems: the breathing system according to A. Strelnikova, K. Buteyko, K. Dinaiki, joint gymnastics according to Bubnovsky.		
BD	HsC	Professional Kazakh (Russian) Language	**Purpose:** to provide professionally oriented language training of a specialist who is able to competently construct communication in professionally significant situations and speak the language norms for special purposes. **Content:** Professional language and its components. Professional terminology as the main feature of scientific style. Scientific vocabulary and scientific constructions in educational-professional and scientific-professional spheres. Algorithm of work on the analysis and production of scientific texts on specialty. Producing scientific and professional texts. Basics of business communication and documentation within the framework of future professional activity.	3	✓ ✓ ✓ ✓
BD	HsC	Professionally Oriented Foreign Language	**Purpose:** the formation of intercultural and communicative competence of students in the process of foreign language education at a sufficient level A2 and the level of basic sufficiency B1. **Content:** A professionally oriented foreign language is used in the field of ICT. The issues of programming, database development, network technologies, the use of Big Data, DB, Machine Learning tools in English are studied. Practical skills of analysis, design, implementation of ICT developments in a foreign language.	3	✓ ✓ ✓ ✓
GED	OC	Information and Communication Technologies	**Purpose:** Knowledge of computer systems, software and hardware (PAO) of the subject area. **Content:** Using information resources to search and	5	✓ ✓ ✓

					store information, working with spreadsheets, working with databases. Application of methods and means of information protection; design and creation of websites, presentations. Skills in using e-government and electronic textbooks, cloud mobile technologies, SMART technology management.			✓	✓								✓	
5	Fundamentals of Mathematical and Natural Sciences	BD	HsC	Physics	**Purpose:** to form a scientific method of cognition among students, for which it is necessary to provide a presentation of the course based on the qualification characteristics of a future specialist, to ensure that the student learns the relationship between classical and modern physics and the limits of applicability of certain theories and laws. **Content:** the laws of classical and modern physics are considered; modern scientific equipment and methods of physical research; techniques of modern physical experiment. The degree of reliability of the results of theoretical and experimental studies is evaluated; an experiment is planned and its results are processed. The acquired knowledge is used to solve specific problems from various fields of physics: mechanics, thermodynamics and molecular physics, electrodynamics, optics, etc.	5		✓	✓								✓	
		BD	HsC	Algebra and geometry	**Purpose:** to give future engineers a certain amount of knowledge in mathematics, necessary both for studying related engineering disciplines and special courses; to develop mathematical intuition and the ability to apply the studied mathematical methods in solving applied problems related to the student's future specialty. **Content:** the basic fundamental concepts of linear algebra and analytic geometry are explained. He is proficient in the mathematical apparatus of the theory of matrices, determinants and systems of linear equations, vector algebra, analytical geometry, the theory of lines and surfaces of the second order. Skills of solving applied problems in the field of ICT in the implementation of methods of protection against threats.	4		✓	✓								✓	
		BD	HsC	Mathematical Analysis	**Purpose:** to give future engineers a certain amount of knowledge in mathematics, necessary both for studying	4		✓	✓								✓	

				related engineering disciplines and special courses; - to develop mathematical intuition and the ability to apply the studied mathematical methods in solving applied problems related to the student's future specialty; - to foster mathematical culture and the ability to work with literature. **Contents:** the main fundamental concepts of mathematical analysis are considered: differential calculus of functions of one real variable, indefinite integrals and the use of integration methods, definite integrals and their implementation in geometry, mechanics and physics, programming.												
BD	EC	Applied Algorithm Theory	**Purpose:** to familiarize students with the main applied problems and methods of discrete mathematics; to acquire the skills of describing discrete objects using mathematical models. **Content:** Formation of knowledge, skills of analysis, determination of the effectiveness of algorithms. Performing binary search, sorting by selection and inserts, merging, TimSort. The ability to find the k-th ordinal statistics. Performing practical tasks of Karatsuba, Strassen algorithms, associative arrays, binary search trees, 2-3 and red-black trees. Hash table operation, implementation by the chain method, open addressing. Solving problems of nonlinear programming, finding shortest paths in a graph, the ability to determine the patterns of algorithms and their models.	4		✓				✓	✓			
		Graph Theory	**Purpose:** introduction to the basic concepts of graphs, the deductive nature of mathematics, the subject of graph theory, trends in the development of modern combinatorics and graph theory; the basic principles of the development of effective algorithms on graphs, the choice of data structures, data preparation. **Content:** examines the basic concepts of graph theory, methods, algorithms for solving problems on graphs, methods for studying various types of objects and substructures in graphs, as well as a number of classical problems on graphs and networks, with a description of			✓				✓	✓			

		BD	EC																	
					algorithms for solving them, an analysis of the complexity of algorithms. Implement standard schemes for constructing algorithms on graphs, apply them to the programming languages used.															
		BD	EC	Probability Theory and Mathematical Statistics	**Purpose:** Formation of knowledge about the basic properties of probabilities, their calculation. **Content:** Determination of numerical characteristics by continuous, discrete random variables. Correlation analysis. Software calculation of moments of distribution functions. Estimates of basic distributions in statistics (MMP). Practical application of Minitab, Stat Soft, State applications for the development of k-th order probabilistic models, verification of hypotheses of homogeneity, significance of coefficients, adequacy of models. Conducting regression analysis.	4		✓	✓								✓	
				Applied Mathematical Statistics	**Purpose:** introduction to the basic concepts and methods of applied statistics. **Content:** the basic concepts of mathematical statistics, methods of nonlinear dynamics are considered. He has the skills to build and analyze multidimensional statistical models of information security tasks, machine learning, and data mining. It uses modern computing tools and mathematical application software packages to evaluate the results of visual data display, forecasting the resilience of systems and networks to threats.			✓	✓								✓	
		BD	EC	Mathematical Logic	**Purpose:** The main sections of mathematical logic based on Boolean algebra are studied; the application of methods for solving problems and proving statements. **Contents:** Build truth tables, conjunctive, disjunctive normal forms, write down predicate logic formulas, prove various statements, draw conclusions. Construction of combinational schemes, Veitch diagrams, Carnot maps to minimize Boolean functions. Application of the laws of mathematical logic in the design of digital circuits, information security tasks, cryptography, network addressing.	5		✓		✓								
				Modal Logic	**Purpose:** familiarization with the basic concepts of modal logic, the specifics of the construction of modal systems.			✓		✓								

No	Module name			Discipline name	Description	Credits												
					Content: examines the logical foundations of knowledge representation and reasoning modeling, touches on modern research directions in this area. Systematization of the basic algorithms for modeling reasoning in modern systems; generalization of the basic principles of logical approaches to the representation of knowledge, devices of logical inference systems; construction of domain models using logical languages.													
6	Programming Basies	BD	HsC	Algorithmic and Programming	**Purpose:** Mastering the basics of algorithmization of tasks, programming methods based on the Python language. **Content:** practical application of basic schemes for solving problems of various classes. Identification, analysis and structuring, definition of input and output data. Python as a Web development language. Coding in Python based on standard algorithms, debugging with obtaining an adequate result using the Django framework, Full Stack Framework. Using standard programming language libraries.	5						✓		✓	✓			
		BD	EC	Graphical User Interface	**Purpose:** To study the software shell for the user to work with the OS. **Content:** Skills of placing graphic modules in the workspace of the corresponding parent program. Synchronization of access to a resource (mutexes, semaphores). Skills of creating basic GI elements: input and output of information (buttons, switches, combobox, label, edit field, listbox, menu, etc.	4						✓		✓	✓			
				Content and Language Integrated Learning	**Purpose:** to promote the mastery of professional vocabulary, to form the skills and abilities of reading and translating specialized literature, as well as to develop the skills of professional speech communication in English within the subject matter covered. **Content:** Provides knowledge in the field of programming of the fundamentals of the disciplines of the specialty necessary for further education and creativity in English during the study of the discipline. Communication skills with the use of information technology. The ability to use information resources and hardware and software in English.		✓	✓				✓						

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Code	Cycle	Discipline	Purpose / Content	Credits												
BD	EC	Introduction to the Specialty	**Purpose:** ideas about the development of algorithms, the basics of programming sufficient to study other disciplines of the specialty and used in further professional activities. **Content:** The basic concepts of automated information systems, the principles of information interconnection of algorithms of actions, databases, network technologies, information security tools are studied. Basic GUI concepts. Skills in developing programs of various algorithm schemes in Python. Programming in the environment of modern frameworks, tools; independently debug and test the developed program.	4				✓			✓	✓				
		Fundamentals of Academic Writing	**Purpose:** formation of professional competence and expansion of communicative competence related to analytical textual activity; formation of skills to analyze expressive units of language. **Content:** expands communicative competencies in the field of the use of the state, Russian and foreign languages in relation to the academic sphere; develops pragmatic thinking skills based on the materials of the state, Russian and foreign languages, the ability to analyze variant units of the language and competently select the right unit depending on the goals and conditions of communication.					✓			✓	✓				
BD	HsC	Educational Practice	**Purpose:** formation of professional competence and expansion of communicative competence related to analytical textual activity. **Content:** Consolidation of theoretical knowledge about the basic schemes of algorithms and skills in the development of algorithms, programs on Phyton. Types of information processes, sources and receivers of information. Development of programs and application of Python GUI tools for solving typical tasks. Report generation skills. The use of automated office management systems; Develops teamwork skills, compliance with ethical and social norms.	1			✓	✓						✓		
BD	EC	Technologies of Programming	**Purpose:** to prepare a student as a specialist who is able to freely adapt to the rapidly changing market of technology and software; to study the basics of	5				✓			✓			✓		

№	Module			Discipline	Description	Cr													
					algorithmization and programming in C++. **Content:** study of the main provisions of programming technology; definition of modern technical, software, technological solutions used in software development. Program design taking into account each stage of the program life cycle from design to implementation, maintenance. Use of practical design tools, development of various types of software, including on the basis of OOP; develop program documents, conformity assessment.															
				Data Structures	**Purpose:** To study the structure of data representation of various complexity (arrays, lists, hash tables, stacks, queues), systematization of their internal organization. **Content:** Formation using data types, links, operations on them in the selected programming language. Using methods of formalization of software program code tasks, their graphical display. Justification of the choice of processing structures, the method of effective storage of test data sets, processing large amounts of information. Methods and means of refactoring and optimizing program code.				✓	✓				✓	✓				
7	Instruments of Aplication Integration	PD	EC	Systemic Programming	**Purpose:** to introduce students to the basic theoretical and practical aspects of system programming at the level of program development, allowing them to obtain modern programs with a complex logical structure at the lowest cost. **Content:** the features and modern achievements in the field of system programming, development of Windows/ Linux applications are considered; Mastering the basics of system programming, technologies for creating file system management applications, processes, asynchronous I/O. Development of programs and projects covering system programming issues using Win32/64/Linux functions.	4			✓					✓	✓				
				Linux Operating System	**Purpose:** to study the general principles of building operating systems (OS), as a means of effective management of the computing process through the rational allocation of computing system resources, and software tools for creating a user-friendly interface.				✓					✓	✓				

#	Module			Discipline	Description	Cr													
					Content: promotes the acquisition of knowledge, ideas about the services provided by modern operating systems, their capabilities, limitations, and methods of implementing these services. Provides information about the boot procedure of a PC-compatible computer, disk partitions, disk access networks, TCP/IP network settings, security practices. Introduces the administration of Linux OS, Unix family. Deploy and configure Linux OS in various hardware configurations.															
		PD	EC	Basies of Web Programming	**Purpose:** theoretical and practical training of students in the field of web application development using a modern programming language. **Content:** Learning Spring Boot tools for creating interactive Web applications. Markup language. Skills in creating headings, paragraphs, lists, links. Embedding JavaScript code in HTML to control the behavior and content of web pages. CSS to describe the appearance and layout of the page. Using jQuery and the ASP platform.Net, metronic templates in laboratory classes for Web development.	4			✓				✓	✓					
				Linear and Nonlinear Programming	**Purpose:** teaching students to solve variational problems, minimization of multifunctional variables, linear programming, optimization of numerical methods, control of linear and nonlinear systems, monitoring and control of linear systems, etc. **Content:** introduces the basic concepts of linear and nonlinear programming; general formulation of mathematical programming problems, dynamic programming. Conducting an analysis of the problem statement on the choice of solutions; using the model, get the result, interpret it in meaningful terms of the problem being solved and evaluate its effectiveness.			✓	✓					✓					
8	Theory of management and economical-effectiveness	PD	EC	Programming Language Java	**Purpose:** to form a system basic representation. To prepare students for the application of Java programming knowledge in subsequent disciplines, in training, as well as after graduation in professional activities. **Content:** Knowledge of the capabilities of the Java programming language. Object learning, Polymorphism,	5			✓				✓	✓					

					Course	Description	Cr													
						Inheritance, Collections (Collections, List, Map, Set), JPA container, Hibernate. Skills of working with files, file, console classes. Coding applications in Java, using the Spring, Spark frameworks; developing applets; using GUI elements; Using standard sets of programming language libraries.														
					Basies of Game Theory and Operations Research	**Purpose:** to study the basic concepts, statements and methods that play a fundamental role in modeling the decision-making process, mastering the methodology of operational research, mastering the theory and practice of constructing and analyzing operational models in various fields. **Content:** explains the concepts of game theory, exact and approximate methods of solving games; the general formulation of network planning problems, game theory. Forms a set of alternative solutions, set a goal and choose an evaluation criterion of optimality, formulate restrictions on controlled variables related to the specifics of the simulated system; justify the choice of a suitable mathematical method, give an algorithm and a program for solving the problem.			✓	✓					✓				
		PD	EC		Economics and Organization of Production	**Purpose:** formation of students' complex of knowledge about the theoretical foundations, essence, principles and methods of assessing enterprise management processes from the point of view of socio-economic efficiency; practical development of methods for calculating technical and economic indicators of the enterprise. **Content:** introduces the essence of the enterprise as an object of management, its place and role in the system of the national economy, its characteristics. The course examines the resource base of the enterprise and the efficiency of the use of various resources, the economic mechanism of the functioning of the enterprise and the financial results of its activities. Helps to master the methodology of economic calculations for analysis, making business decisions of an executive, managerial nature.	4		✓		✓								✓
					Entrepreneurship	**Purpose:** mastering by students the scientific and			✓		✓								✓

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№																		
					legislative foundations of the organization and conduct of entrepreneurial activity in the Republic of Kazakhstan; studying the features, problems and prospects of its development in the Republic of Kazakhstan. **Content:** the mechanism of entrepreneurship is revealed taking into account the accumulated experience of the development of theory and practice in developed countries, the experience of the formation of entrepreneurship in Kazakhstan, the application of civil legislation regulating the organization of entrepreneurial activity. The conditions of the emergence, development and termination of entrepreneurial activity are considered; features of financing, business planning, staffing of entrepreneurial activity. Develops the ability to generate business ideas, analyze and justify the reality of a business plan.												
9	Fundamentals of Information theory	BD	EC	Fundamentals of information Security	**Purpose:** formation of bachelors' knowledge about balanced protection of confidentiality, integrity and availability of data, taking into account the expediency of application, instilling practical skills in designing security policies based on modern tools and technologies. **Content:** formation of knowledge about the principles of information security. Identification and analysis of information threats and countering them. Application of hardware and software methods to protect computer information from remote attacks, network security. Implementation of security policy models. Managing access levels of user groups. Definition of criteria and assignment of the IP security class, protection of the integrity of information when performing laboratory work.	4							✓			✓	
				Modern Cryptography	**Purpose:** acquisition of systematized theoretical information about the basic principles of cryptographic protection of information with implementation in information systems. **Content:** introduces the basic provisions of cryptography, classes of ciphers, methods of their								✓			✓	

№		BD/EC		Discipline	Description	Cr														
					cryptanalysis, concepts of information integrity, cryptographic protocols, electronic signature. Explains the mathematical theory underlying cryptography (theory of groups, Galois fields, irreducible polynomials, number theory, pseudorandom sequences). Implementation of encryption algorithms when used in practice, their cryptanalysis.																
		BD	EC	Software Architecture and Design	**Purpose:** A set of decisions on the organization of a software system, various notations and formalism are studied. **Content:** Combining in practice the selected elements of structure and behavior into ever larger systems. Research and description of the boundaries, structure, behavior of the system and objects in its composition. Code generation in programming languages based on diagrams, UML tools. Using UML to demonstrate and visualize the architecture of the program, its components.	4				✓	✓			✓						
				Coding Theory	**Purpose:** mastering the discipline by students of modern coding theory. Fundamental training of students in the field of information theory and coding theory; providing advice to students in conducting their own theoretical and experimental studies of telecommunication networks and systems. **Content:** examines the basics of modern code theory; find the distance, weight of the code word; encode and decode linear and cyclic codes. Develops the ability to apply methods of effective and noise-resistant encoding of information, methods of analog-to-digital signal conversion, methods of digital data compression to evaluate the solution of solving problems.					✓	✓			✓						
10	Hardware of Computer System	BD	EC	Digital Circuitry	**Purpose:** formation of basic training of students in the field of studying digital devices and developing skills in using digital technology. **Content:** formation of knowledge of digital element base, mathematical foundations of digital logic. Hierarchy of the computer structure. Explanation of the collaboration of elements in the composition of digital devices. Skills in designing functional nodes of	5			✓		✓	✓								

					combinational and sequential types, organization of 2D, 3D memory. Examples of building serial and parallel type registers. Practical skills of building a model of an electronic traffic light, amplifiers on logic elements, a sound simulator, etc.														
				Digital Communication Technology	**Purpose:** formation of basic training of students in the field of studying digital devices and developing skills in using digital technology. **Content:** the definition of the main types of modern digital integrated circuits, their circuitry, parameters of ports, signals, understanding of the principles of their functioning is given. Development of language descriptions of digital communications of various types; Mastering practical skills of design and simulation of basic electrical circuits of digital communication devices in real measuring instruments; step-by-step analysis and verification of the first adopted, then implemented technical solution.			✓		✓	✓						
	BD	EC	Architecture and Organization of Computer Systems	**Purpose:** The principles of architecture of computing systems, methodology of construction, prospects of development as an object of informational influence are studied. **Contents:** Directions of development of computers with traditional, parallel and non-traditional architecture; principles of building data transmission networks. Determine the criteria for the quality of aircraft. Distinguish between processor types. Issues of reducing memory access time. Determination of system performance. Develops skills in architecture selection and integration of modern computers, systems and networks.	5			✓		✓	✓						
				Architecture and Topology of Multiprocessor Computing Systems	**Purpose:** Forms knowledge of the organization of multiprocessor computing systems. **Contents:** Flynn Classification, processor matrices: ILLIAC IV, ICL DAP, Goodyear Aerospace XMPP, Connection Machine. Modern SMP, MPP architectures. Features of memory organization of hybrid NUMA and cluster architecture. The SUN Ultra Enterprise family of SUN. Using Map Reduce technology to compute				✓		✓	✓						

					multiple input key/value pairs into multiple output key/value pairs.													
		PD	EC	Standard of Networking Technologies	**Purpose:** acquisition of systematized information about the principles of computer system organization, architecture of standard network technologies, acquisition of practical skills in designing local networks based on modern methods, tools and technologies. **Content:** the classification of computer systems and networks is considered. Basic standards of logical and physical network topology. Hardware component standards are used. The model of interaction of open systems, the protocols of computer networks used. Network technology standards. Determination of network addressing during laboratory classes. Develops skills in applying international standards for network design when performing group independent work.	5			✔		✔	✔		✔			
				Computer Network Components (Cisco 1)	**Purpose:** formation of knowledge and skills in designing computer networks, interaction of network devices. **Contents:** the classification of computer systems and networks is considered. Basic standards of logical and physical network topology. Hardware component standards are used. The model of interaction of open systems, the protocols of computer networks used. Network technology standards. Determination of network addressing during laboratory classes. Develops skills in applying international standards for network design when performing group independent work.				✔		✔	✔		✔			
		PD	HsC	Industrial practice 1	**Purpose:** To acquire practical skills in analyzing communication systems programming technologies, to adapt to the labor market in a specialty related to ICT and software development. **Content:** Analysis of requirements taking into account the functions performed by ICS, development of technical specifications, selection of rational software architecture, determination of information flows. Acquisition of practical skills in software development, including on the basis of OOP, frameworks (Django,	4			✔	✔				✔	✔		

№	Subject			Course	Description	Cr.													
					Spring, Javascript), development of standard information objects. Methods and means of software refactoring and optimization.														
11	Database management	PD	EC	"Big Data" Technology	**Purpose:** to provide an in-depth understanding of Big Data technologies and the features and prospects of their use in practice. **Content:** The technologies of preparation, storage, processing and analysis of big data are considered; key characteristics of big data. Application of statistical and mathematical methods for processing Big Data. Define data criteria for search and extraction by special programs. Generate relevant information from extracted data. Apply the Map Reduce information processing model, components of the Hadoop cluster ecosystem.	5						✓		✓				✓
				Special Software	**Purpose:** students acquire knowledge about digital information processing in telecommunications. **Content:** examines digital information processing technologies in telecommunications; models, methods and means of collecting, storing, communicating and processing information using computers. Current trends in digital information processing in telecommunications. Modes of implementation of technological processes in computing systems. Fundamentals of blind signal processing. Fundamentals of ultra-wideband signal processing. Distributed data processing systems. Methods and algorithms of digital processing of speech signals.							✓		✓				✓
		PD	EC	Basies of Intelligent Systems	**Purpose:** To study the blocks of intelligent systems: knowledge base, decision output mechanism, intelligent interface. **Content:** Presentation of tasks in natural and formalized languages. Modeling of fuzzy sets, fuzzy logic. Knowledge representation in intelligent systems by means of production systems, semantic networks, frames; logical inference algorithms based on knowledge. Practical use of intelligent systems for recognizing text in an image. Application of rules, algorithms and technology for creating test datasets.	5				✓	✓	✓						

				Fundamentals of Robotics	**Purpose:** to teach the student to reproduce the acquired knowledge, practical skills and abilities in the study of the basics of robotics, as well as to apply and use the acquired knowledge in the development of software products. **Content:** examines the application and main capabilities of robotic systems; design methods and principles of RTS functioning. Analysis of objects of RTS logical control; preparation of technical specifications for the development of robotic devices; calculate characteristics and select RTS elements; Programming algorithms for robots of various types; synthesis of control automata by regular methods.						✓	✓	✓				
		PD	HsC	Database Management System	**Purpose:** to acquire theoretical knowledge about database design; to study the theoretical foundations of database management systems; to acquire practical skills in using and implementing modern database management systems on a computer. **Content:** Formation of knowledge about databases, data models; functions of the database management system; modern technologies of data storage and retrieval. Application of SQL query development methods, MySQL for design and management; Definition of criteria for data search and extraction. Skills in developing client and server parts using modern DBMS. Monitoring the use of the database. Analysis of events when using the database. Means and methods of database access control.	5						✓		✓		✓	
		PD	HsC	Industrial practice 2	**Purpose:** consolidation and deepening of theoretical and practical knowledge gained in the study of general professional and special disciplines. **Content:** allows you to demonstrate: ability to systematize knowledge of architecture, organization of computer systems; skills in analysis, synthesis of electronic circuits, calculation of elements of digital devices, taking into account current trends in the development of electronics, architecture of computer systems. To demonstrate the ability to search, evaluate	6					✓	✓				✓	

12	Programming Tools				information necessary for the formulation, solution of professional tasks for the formulation of technical requirements of computing systems in production conditions.						✓	✓		✓				
12	Programming Tools	BD	EC	Logical Programming	**Purpose:** Examines syntax, semantics, theoretical foundations of logic programming; search management skills. **Content:** Be able to implement basic logic programming algorithms, embed them in various types of applications. Possess skills of analysis of the mechanism of calculations, methods of designing logical programs; skills of practical programming of specific tasks from various subject areas in the language environment of logical programming.	4					✓	✓		✓				
				Functional Programming	**Purpose:** study and practical development of logical and functional programming tools for solving scientific and applied problems. **Content:** examines syntax, semantics, theoretical foundations of functional programming; understanding the mechanism of search management. Be able to implement the basic algorithms of functional programming, embed them in applications of various types. Possess skills of analysis of the mechanism of calculations, methods of designing functional programs; skills of practical programming of specific tasks from various subject areas in the language environment of functional programming.						✓	✓		✓				
		PD	EC	Machine Learning	**Purpose:** To study the basics of machine learning. Machine learning methods. **Content:** Obtaining empirical dependencies based on mathematical statistics and probability theory. Classical problems solved in machine learning. Application of types of training (based on precedents, deductive). Clustering skills when learning without a teacher. Various techniques for working with data in digital form (signals, video sequence, image, feature description). Making predictions is a consequence of learning.	6					✓	✓		✓				
				C# Programming Language	**Purpose:** to study the basic concepts and constructions of modern programming languages, to study the general						✓	✓		✓				

				Credits													
			principles and to gain skills in the practical application of object-oriented programming C#. **Content:** Reveals the basics and concepts of application development using C# programming elements. Be able to link the formal definition of a programming language with the technology underlying the translation methods. Possess techniques, experience in creating applications in the C# environment, class management through interface elements; Possess experience in applying the paradigm of modern programming in professional activities.														
BD	HsC	Object-oriented Programming	**Purpose:** mastering the basics of the object approach, object-oriented and generalized programming, acquiring skills in developing program code using modern tools for MS Windows and Linux platforms. **Content:** describes the basic principles of object-oriented construction of software systems; explains the concepts of classes, objects and the relationship between them. Develops the ability to use OOP tools in PyCharm; apply the basics of multithreaded and distributed programming in practice; develop algorithms and programs based on OOP.	5			✓	✓		✓					
PD	EC	Big Data Analytics	**Purpose:** To study the tasks and basic methods of data analysis. **Content:** The use of Predictive analytics and ready-made templates of any objects to predict the probability of events based on available data. Research of special technologies. Application for analysis of various tools and technologies: special software: No SQL, Map Reduce, Hadoop, R; Datamining – extraction of previously unknown data from arrays using a large set of techniques.	5			✓	✓		✓			✓	
		Application Software	**Purpose:** formation of students' basic competencies in the field of application software use, which are further developed in the formation of professional competencies of a specialist in technical and software engineering. **Content:** examines the concept of technological operation, life cycle, stages of software product development, requirements for a software product.				✓	✓		✓			✓	

№	Module			Discipline	Description	Cr												
					Develops the ability to develop a technical specification for a software product; develop a structural and functional scheme of software; use the method of step-by-step detailing for designing the structure of software. Develops skills in developing software structures; debugging and testing developed software; compiling software documentation.													
13	Multimedia technologies	BD	EC	Basies of Automatical Recognition	**Purpose:** to teach the student to reproduce the acquired knowledge and practical skills in pattern recognition, to teach him to use the basics of a modern approach in the development of software products for pattern recognition, to creatively apply and use the acquired knowledge. **Content:** explains the basic techniques and methods of pattern recognition by signs; Attribution of the source data to a certain class. Determination of the types of tasks of the functioning phase. Using classification rules. Examples of systems that solve the recognition problem. Application of speech recognition methods, images, texts. Possess mathematical and algorithmic apparatus used in solving recognition problems.	4				✓		✓	✓			✓
				Research Work of Students	**Purpose:** to increase the level of training of students through the development of methods, techniques and skills in the process of teaching, the development of their creative abilities, independence, initiative in studies and future activities. **Content:** Intellectual activity. Scientific research. Methodology of scientific research. The main methods of searching for scientific information. Methodology of preparation of the report and presentations.			✓	✓			✓		✓		
		PD	HsC	Web Services Development (Java EE)	**Purpose:** Java Enterprise Edition is being developed – a platform for creating enterprise applications in the Java language. **Content:** Study and application of API: Java Servlets – special modules for processing requests and sending the result. HTML content generation, pages with HTML/JavaScript/CSS code interspersed with Java code. The use of hypertext editors. Writing hypertext routines in JavaScript. Ensuring information security of	6				✓		✓	✓			✓

№	Module	PD/BD	EC	Discipline	Purpose/Content	Cr.												
					web applications.					✓			✓	✓				✓
		PD	EC	Basies of Developing Mobile Applications	**Purpose:** features of the use of service programs, shells in the development of mobile applications. **Content:** describes the features of the use of service programs, shells in the development of mobile applications. Possess the skills of development, use of service programs, service shells in the development of mobile applications. Skills in choosing optimal software products, OT models from several possible solutions to applied problems. Programming of the multimedia object. Apply modeling principles to create a model of an implemented multimedia object. Monitor and select software tools for modeling multimedia information. Import a multimedia project into the format of mobile gadgets.	5				✓			✓	✓				✓
				Arduino and 3D Printing Technology	**Purpose:** students acquire practical skills in developing software for microcontrollers according to a given methodology, taking into account current trends in the development of electronics and computer technology. **Content:** considers Arduino as an infrastructure, an environment where electronic and mechanical components are assembled into a single device, and programming the behaviors of these components. Studies the hardware part (electronic boards with a microcontroller, accompanying elements-a power stabilizer, a quartz resonator, blocking capacitors). Develops the ability of practical programming of microcontrollers (Arduino), compile programs in an integrated software environment, load them into hardware; use 3D-Printing.					✓			✓	✓				✓
14	Module of new professional competencies acquisition	BD	EC	Subjects on the Additional Educational Program	**Purpose:** students acquire practical skills in developing software for microcontrollers according to a given methodology, taking into account current trends in the development of electronics and computer technology. **Content:** allows you to determine the degree of assimilation by bachelors of the volume of training modules, professional competence and readiness of the graduate for professional activity. Allows you to show and evaluate the acquired knowledge, skills and	12	✓	✓						✓				✓

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15	Module of Final Certification	PD	HsC	Predegree and Industrial Practice	**Purpose:** to collect primary scientific and technical data necessary and sufficient to complete a graduation project or graduate research papers in accordance with the assignment approved by the graduating department. **Content:** develops the ability to: correctly represent the structure of the practice base, describe the production processes of the enterprise; discuss the use of software, computer equipment of the enterprise; analyze the technical condition, production process, life safety measures; offer their own software packages, create software products on the instructions of the enterprise for implementation into production; develop solutions to real engineering problems, perform their evaluation.	10	✓	✓					✓		✓
				Writing and Defending a Thesis, a Graduate work, or Preparing and Passing a Comprehensive Exam	**Purpose:** has the purpose of systematization, generalization and verification of special theoretical knowledge and practical skills of graduates. **Content:** Bachelor's work is a central part of completing the course of study. With this work, students show that they have the ability to independently present complex computer scientific and technical problems and their connection with other industries, combine and apply the acquired knowledge of software tools, programming systems, computing and information technologies in their further work and professional activities.	8	✓	✓					✓		✓
				Total:		**240**									

competencies, including those with in-depth specialization within the framework of the main program.

5. Summary table reflecting the volume of disbursed loans by EP modules

Course of Study	Semester	The number of mastered modules	The number of studied disciplines			Number of KZ credits					Total hours	Total KZ credits	The number of	
			OK	UC	CC	Theoretical training	Educational practice	Industrial practice	Industrial practice, pre-graduate	Final examination			exam	Diff.test
1	1	4	7	1		28	2				900	30	7	1
	2	4	3	5		26	2	2			900	30	5	3
2	3	3	1	2	5	28	2				900	30	6	2
	4	5	4	2	1	24	2		4		900	30	5	2
3	5	4			7	30					900	30	6	1
	6	4		1	4	24			6		900	30	4	1
4	7	3		1	3	20					600	20	4	
	8	3		1	3	20					600	20	4	
	9	1		1					10	8	600	20		1
Total		15	15	14	23	200	8	1	20	8	7200	240	41	11

6. Strategies, teaching methods and artificial intelligence, monitoring and assessment

Learning strategies	**Student–centered learning:** The student is the center of teaching/learning and an active participant in the learning and decision-making process. **Practice-oriented training:** orientation to the development of practical skills.

Teaching methods	Conducting lectures, seminars, various types of practices with:
	 • the use of innovative technologies:
	  • problem-based learning;
	  • case study;
	  • work in a group and creative groups;
	  • discussions and dialogues, intellectual games, olympiads, quizzes;
	  • reflection methods, projects, benchmarking;
	  • Bloom's taxonomies;
	  • presentations;
	 • rational and creative use of information sources:
	  • multimedia training programs;
	  • electronic textbooks;
	  • 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: • survey in the classroom; • testing on the topics of the discipline; • * control works; • protection of independent creative works; • discussions; • trainings; • colloquiums; • essays, etc. **Boundary control** at least twice during one academic period within the framework of one academic discipline. Intermediate certification is carried out in accordance with the working curriculum, academic calendar. Forms of holding: • exam in the form of testing; • oral examination; • written exam; • combined exam; • project protection; • protection of practice reports. **Final state certification.**

EDUCATIONAL AND RESOURCE SUPPORT FOR EP

Information Resource Center	The structure of the JRC has 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The basis of the network infrastructure of the OIC 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 OIC – 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 their own generation have been created: "Almamater", "Works of scientists of SKSU", "Electronic Archive".Online access from any device 24/7 via an external linkhttp://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 JRC 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 JRC; 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 JRC.
Material and technical base	The material and technical base of the department, its equipment with computer equipment ensure high efficiency of the educational process. The Computer Engineering and Software Department has 403, 404, 405 computer classes of the academic building No.4. During the educational process, students use the computer classes of the main building to perform laboratory work and SRS.Also in the main building there is an educational and laboratory complex from Huawei (Huawei ICT Academy), in which the direction of "Computer Networks" is studied. Minimum characteristics of computers: <table><tr><td>Name</td><td>Parameters</td></tr><tr><td>1. CPU</td><td>Core i3-9100 3.6GHz</td></tr><tr><td>2. MB</td><td>Gigabyte H310 LGA 1151</td></tr><tr><td>3. RAM</td><td>DDR4 8Gb</td></tr><tr><td>4. HDD</td><td>1 Tb</td></tr><tr><td>5. VC</td><td>Intel UHD Graphics 630</td></tr></table>

APPROVAL SHEET

by Education Program code
6B06130– «Computer engineering and software»

Director of DAA   _____Naukenova A.S.
_{sign}

Director of DASc   _____Nazarbek U. B.
_{sign}

Director of DE&C   _____ Bazhirov T. S.
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