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MINISTRY OF SCIENCES AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M.O. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»
Chairman of the Board-Rector
D.Zh.Ahmed-Zaki
_____2026y.

Educational program

6B06141- Virtual Reality Modeling and Construction

code and name

Registration Number	6B06100023
Code and Classification of Education	6B06 Information and Communication Technologies
Code and Classification of Areas of Training	6B061 Information and Communication Technologies
Group of educational programs (EP)	B057 Information Technology
Type of EP	current
ISCE level	6
NQF level	6
IQF level	6
Language learning	Kazakh, Russian, English
The complexity of EP	240 credits
Distinctive features of EP	-
Partner University (JEP) -	-
University partner (DDEP) -	-

Shymkent, 2026

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The educational program has been updated taking into account the new model of inclusive education and agreed with the City department of employment and social protection.

Deputy Head of the Department of Employment
and Social Protection of Shymkent_____K.Kaldykarayev

The OP was considered at a meeting of the Academic Quality Committee of the «Computer engineering and Energy» Higher School, Minutes #4 «27» 01 2026 y.

AC Chairman _____ Sahmetova G.E.

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

Minutes #4, «27» 02 2026 y.

Chairman of the EMM_____E.Imangaliyev

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

Minutes #14, «26» 03 2026y.

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1. CONCEPT OF THE EDUCATIONAL PROGRAM

University Mission **University values**	• Generation of new competencies, preparation of a leader who translates research and entrepreneurial thinking and culture • 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 – builds trust and support in relationships where everyone wins. • Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.
Graduate Model	• Deep subject knowledge, its application and constant expansion in professional activity. • Information and digital literacy and mobility in a rapidly changing environment. • Research skills, creativity and emotional intelligence. • Entrepreneurship, independence and responsibility for their activities and well-being. • Global and national citizenship, tolerance for cultures and languages.
EP Alignment with SDGs	**SDG 4. Quality Education** The 6B06141 Virtual Reality educational programme contributes to quality education by developing digital competencies, spatial thinking and skills in designing interactive learning environments. Students acquire knowledge of virtual and augmented reality technologies, three-dimensional modelling and modern programming methods. **SDG 8. Decent Work and Economic Growth** The programme prepares competitive specialists for the digital economy and creative industries. Skills in VR/AR application development, software testing and information process management expand opportunities for skilled employment and can improve workplace productivity. **SDG 9. Industry, Innovation and Infrastructure** The programme supports technological innovation through interactive 3D modelling, programming and virtual environment design. These competencies enable graduates to develop digital twins, model industrial processes and create solutions that support the digital transformation of enterprises.
The uniqueness of the EP	• Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders. • Practice orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow you 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. 8 n/a dated 08/01/2025). • 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 Organisations of Higher and Postgraduate Education», approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 as reworded by order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated June 24, 2024. No. 307; 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 as reworded by order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 26, 2024. No. 372; 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 as reworded by order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated March 04, 2025. No. 90; and as amended by Order No. 225 dated May 04, 2026.5. Rules for organizing torganizing 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 as reworded by order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated April 29, 2024. No. 203; 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 as reworded by order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated June 20, 2024. No. 207; 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 н/қ 9. Digital Code of the Republic of Kazakhstan No. 255-VIII ZRK dated January 9, 2026. • 10. Model Rules for the Organization of the Work of Collegial Governing Bodies of Higher and (or) Postgraduate Education Organizations. Approved by Order No. 156 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated April 1, 2025.
Organization of the educational process	• Implementation of the principles of the Bologna Process • Student-centered learning • Availability • Inclusiveness
EP quality assurance	• Internal quality assurance system • Involvement of stakeholders in the development of the EP and its evaluation • Systematic monitoring • Updating the content (updating)
Entry Requirements	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 the EP for persons with disabilities and the GEP	For students with SEN (special educational needs) and persons with disabilities (PSI), tactile PVC tiles, specially equipped toilets, a mnemonic diagram, and shower bars have been installed in educational buildings and student dormitories. Special parking spaces have been created. Crawler lift installed. There are desks for people with limited mobility (PLM), signs indicating the direction of movement, ramps. In the educational buildings (main building, building No. 8) there are 2 rooms with six working places adapted for users with disorders of the musculoskeletal system (DMS).For visually impaired users, the SARA™ CE Machine (2 pcs.) is available for scanning and reading books. The library website is adapted for the visually impaired. There is a special NVDA audio program with a service. The JIC website http://lib.ukgu.kz/ is open 24/7. An individual differentiated approach is provided for all types of classes and in the organization of the educational process.

2. PASSPORT of the EP

Purpose of the EP	consists in the training of highly qualified and sought-after specialists in the field of modeling and designing virtual reality that meets the requirements of the labor market.
EP tasks	- formation of socially responsible behavior in society, understanding the importance of professional ethical standards and following these standards; -providing lifelong learning skills that will enable them to successfully adapt to changing conditions throughout their professional careers; - 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 labor in the field of information technology; - formation of the competitiveness of graduates in the field of digital technologies to ensure the possibility of their fastest possible employment in their specialty or continuing education at subsequent levels of education; - providing knowledge on modeling and designing virtual reality; - provision of multilingual education. - Creating conditions for the formation of in-demand knowledge and skills, a conscious attitude towards improving the well-being of the population and protecting the planet in the context of the SDGs
EP harmonization	• Level 6 of the National Qualifications Framework of the Republic of Kazakhstan; • Dublin Descriptors 6 skill levels; • 1 cycle of the Qualification Framework of the European Higher Education Area (A Framework for Qualification of the European Higher Education Area); • Level 6 of the European Qualification Framework for Lifelong Learning.
Communication of the EP with the professional sphere	Professional standard “Development of graphic and multimedia design”, Developed №222 dated 12/05/2022. Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” (Appendix No. 16) Professional standard “Testing multimedia applications (including computer games)”, Developed №222 dated 12/05/2022. Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” (Appendix No. 21) Professional standard “Providing software support” Developed № 222 dated December 5, 2022. Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” (Appendix No. 5) Professional standard “Software developers and testing specialists, WEB and multimedia applications” Developed №222 dated 12/05/2022. Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” (Appendix No. 2) Professional standard "Development of artificial intelligence applications". Order No. 222 dated 05.12.2022 of the acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" (Appendix No. 17)
Name of the degree awarded	Upon successful completion of this educational program, the graduate is awarded the degree: "Bachelor in Digital Technology" in the educational program "6B06141 -Virtual Reality Modeling and Construction"
List of qualifications and positions	Primary positions: Graphic designer (NKZ code 2166-1-002); Multimedia designer (NKZ code 2166-2-002); Web designer (NKZ code 2166-3-002); Computer game developer (2512-3-001); Web and multimedia application developer (2512-3-002); Animator developer (2512-3-003); Computer game developer (2512-3-004); 3D Generalist; Software support specialist (2132); Application programmer (2519-9-002) in research institutions, design, engineering and other organizations without any requirements for work experience in accordance with the qualification requirements of the National Classifier of the Republic of Kazakhstan (NKZ), approved by order of the Committee for Technical Regulation and Metrology of the Ministry of Investment and Development of the Republic of Kazakhstan dated December 30, 2020 No. 553.
Sphere of professional activity	-Educaiton -Information Technology - Software development
Objects of professional activity	enterprises and organizations of various forms of ownership that develop, implement and operate information technologies in various areas of human activity.

Subjects of professional activity	mathematical and computer models, -computational processes, -programming languages, -network technologies and software packages
Types of professional activity	- simulate various simulators and virtual games for enterprises, industry, education; - create tools for automating and optimizing various processes; - perform software implementation of the tasks of modeling and constructing virtual reality; - test virtual reality systems; - commercialize ICT services; - to carry out maintenance and technical support of virtual systems; - carry out the integration of software modules and their components.
Learning Outcomes	LO1Communicate freely in the professional environment and society in Kazakh, Russian and English, taking into account the principles of academic writing and the culture of academic honesty. LO2 Develop and create effective algorithms for virtual and augmented reality applications, taking into account modern methods. LO3 Design VR and interactive 3D modeling systems. LO4 Manage information processes, test, operate and maintain hardware and software in the field of VR systems. LO5 Apply natural science, mathematical, social, socio-economic and engineering knowledge in professional activities, methods of mathematical data processing, scientific and experimental research, regulatory documents and elements of economic analysis. LO6 Model and design virtual reality, create virtual animation using the fundamentals of engineering modeling. LO7 Construct virtual reality projects using the resources of mathematical and computer models with a preliminary feasibility study of design calculations. LO8 Apply the capabilities of VR and AR systems based on interactive 3D graphics, platforms for creating these applications, the features of their software implementation; LO9 To be able to work effectively individually and as a team member, to defend one's point of view correctly. LO10 Lead a healthy lifestyle, apply the ability of self-learning and self-education throughout life. LO11 Implement and operate ready-made software interface products in the field of VR systems, develop instructions for working with these systems. LO12 Develop mathematical models in various fields with innovative approaches to achieve specific results in mathematical and computer modeling. LO13 Apply machine learning apparatus (artificial neural networks) in the development and implementation of artificial intelligence systems; skills in developing digital twins; methods for solving linear programming and transport problems

3. COMPETENCES OF THE EP GRADUATE

GENERAL COMPETENCES (Behavioral skills and personal qualities)	
GC 1. Competence in managing one's own literacy	GC1.1. The ability to self-learn, self-develop and constantly update their knowledge within the chosen trajectory and in an interdisciplinary environment. GC1.2. Ability to express thoughts, feelings, facts and opinions in the professional field. GC1.3. The ability for mobility in the modern world and critical thinking.
GC 2. Language competence	GC2.1. Ability to build communication programs in the state, Russian and foreign languages. GC2.2. Ability to interpersonal social and professional communication in the context of intercultural communication and an inclusive environment
GC 3. Mathematical and scientific competence	GC3.1. 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.
GC 4. Digital competence, technological literacy	GC4.1. The ability to demonstrate and develop information literacy through the mastery and use of modern digital technologies in all areas of their lives and professional activities. GC4.2. The ability to use various types of digital technologies: Internet resources, cloud and mobile services for searching, storing, protecting and disseminating information.
GC 5. Personal, social and academic competencies	GC5.1. Ability to physical self-improvement and focus on a healthy life to ensure a full-fledged social and professional activity through the methods and means of physical culture. GC5.2. Ability to social and cultural development based on the manifestation of citizenship and morality. GC5.3 The ability to build a personal educational trajectory throughout life for self-development, career growth and professional success. GC5.4. The ability to successfully interact in a variety of socio-cultural contexts at school, at work, at home and at leisure.
GC 6. Entrepreneurial competence	GC6.1. Ability to be creative and entrepreneurial in a variety of environments. GC6.2. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, allocate resources and manage your time. GC6.3. Ability to work with consumer requests.
GC 7: Cultural Awareness and Expressiveness	GC7.1. The ability to show a worldview, civil and moral position. GC7.2. The ability to be tolerant of the traditions and culture of other peoples of the world, to have high spiritual qualities.
PROFESSIONAL COMPETENCES.	
Theoretical knowledge and practical skills specific to this area	PC1 - the ability to recognize trends and prospects for the development of modern information technologies;
	PC2 - the ability to apply application programs for solving problems in the field of mathematical and computer modeling; carry out numerical simulation; to analyze the obtained results; check the adequacy of the models; make predictive decisions;
	PC3 - the ability to develop complex algorithms for virtual and augmented reality; formulate a problem and apply the methods of mathematical and system programming in research activities, in project management for multimedia and virtual reality systems; use mathematical models in the design of VR systems;
	PC4 - the ability to analyze and evaluate the effectiveness of the development, implementation, maintenance and operation of mathematical and computer models of virtual reality systems using modern tools;
	PC5 – Develop alternative versions of the system concept, analyze them and select the best concept. Ability to program using modern tools and artificial intelligence technologies; test and debug software systems; monitor and upgrade software products
	PC 6 - Design and develop, maintain components of virtual reality systems in the field of business, medicine and scientific research;
	PC7 - the ability to solve all issues related to the stages of the technological process, labor safety in production, environmental protection.
	PC8-Proficiency in 3D modeling (SolidWorks, AutoCAD, Blender), VR/AR technologies, digital simulations, prototype visualization; analysis of prototype

	parameters, modeling of material and structural behavior, assessment of product strength and reliability; generation of innovative ideas, design thinking, experimental design

3.1 MATRIX OF CORRELATION OF LEARNING OUTCOMES IN EP IN GENERAL WITH FORMED COMPETENCES

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO 10	LO 11	LO 12	LO 13
GC1			+	+			+						
GC 2	+		+		+		+	+					+
GC 3		+		+		+			+			+	
GC 4	+		+	+			+	+	+	+	+	+	
GC 5		+			+	+						+	+
GC 6		+	+			+			+		+	+	+
GC 7	+	+	+	+	+	+			+		+	+	+
PC1	+		+	+		+	+	+		+	+		
PC 2	+		+			+	+	+	+	+		+	
PC 3	+			+	+	+	+	+	+	+			
PC 4	+		+	+	+	+			+	+			
PC 5			+		+			+		+		+	
PC 6	+			+			+	+	+	+			
PC 7		+		+		+		+	+				+
PC 8				+		+		+					

4. MATRIX OF THE INFLUENCE OF DISCIPLINES ON THE FORMATION OF LEARNING OUTCOMES AND INFORMATION ON LABOR INTENSITY

№	Module	Cycle	component	Name of the discipline	Brief description of the discipline	Quantity Credits	Formed learning outcomes (codes)											
							LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO 10	LO 11	LO 12	LO 13
1	Fundamentals of social sciences	GED	GC	History of Kazakhstan	**Goal:** Formation of an objective idea of the history of Kazakhstan based on a deep understanding and scientific analysis of the main stages, patterns, originality of the historical development of Kazakhstan. **Content:** Formation of an objective idea of the history of Kazakhstan based on a deep understanding and scientific analysis of the main stages, patterns, originality of the historical development of Kazakhstan. 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. Political 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.	5		v									v	
2		GED	GC	Philosophy	**Goal:** Formation in students of a holistic view of philosophy as a special form of knowledge of the world, its substantive sections, problems and methods of studying them in the context of future professional activities. Formation of students' philosophical reflection, skills of introspection and moral self-regulation. **Contents:** The emergence of a culture of thinking. The subject and method of philosophy. Fundamentals of philosophical understanding of the world: questions of consciousness, spirit and language. Being. Ontology and metaphysics.	5		v									v		

					Knowledge and creativity. Education, science, engineering and technology. Philosophy of man and world 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.														
3	Socio-political knowledge	GED	GC	Sociology and political science	**Goal:** Formation of knowledge about socio-political activities, explanation of socio-political processes and phenomena. **Contents:** Consideration of the socio-ethical values of societies. Understanding the features of social, political, cultural, psychological institutions in the context of their role 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. Socialization, identity and deviant behavior: the role of an inclusive approach	4				**v**									**v**	
4		GED	GC	Culturology and psychology	**Goal:** Formation of scientific knowledge of history, modern trends, current problems and methods for the development of culture and psychology, skills of systemic analysis of psychological phenomena. **Contents:** Morphology, language, semiotics, anatomy of culture. Culture of nomads, proto-Turks, Turks. Medieval culture of Central Asia. Kazakh culture at the turn of the XVIII - XIX centuries, XX century. Cultural policy of Kazakhstan. State Program "Cultural Heritage". National consciousness, motivation. Emotions,	4		**v**											**v**	

					intellect. The will of man, the psychology of self-regulation. Individual typological features. Values, interests, norms are the spiritual basis. The meaning of life, professional self-determination, health. Communication of the individual and groups. Socio-psychological conflict. Models of behavior in conflict. Social and psychological foundations and development of inclusive culture in modern society; Psychological characteristics and conditions of professional adaptation of persons with disabilities; Psychological support and tolerance as a way of social integration of people with disabilities; Social and psychological barriers to interaction between persons with normal and impaired development in modern society.														
5	Socio-ethnic development	GED	EC	Ecosystem and Law	**Goal:** 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 interaction between man and nature, productivity of ecosystems and the biosphere. Improving the competitiveness of entrepreneurial activity of society, business and the national economy in conditions of limited resources within the framework of sustainable development goals of Kazakhstan. Systemic understanding of environmental issues and principles of sustainable development. Knowledge and observance of Kazakhstan's rights, duties and guarantees of subjects, state regulation public relations to ensure social progress. Inclusion – the strategy of international lawmaking	5					**v**				**v**				
		GED	EC	Entrepreneurship and financial literacy	**The purpose:** Training skills in entrepreneurial activity organization, in managing personal and family financial resources, which are key to achieving financial well-being. **Content:** Entrepreneurship: essence, contents and conditions of formation. Legal forms of entrepreneurship. Risks in entrepreneurship.	5										**v**			

					Business planning in entrepreneurship. Organization of entrepreneurial transactions. Culture and ethics of entrepreneurship. Financing of entrepreneurial activity. The concept, goals and objectives of financial literacy. Money, settlements, and payments. Personal finance: income, expenses, budget. Taxes and taxation of individuals. Pensions and insurance. Banking services for the population. Bankruptcy of individuals and financial risks. Pyramid scheme and personal financial security.														
		BD	EC	Mukhtar studies	**Goal:** 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. **Content of discipline:** 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 "Korgansyzdyn kүni", "Kyr suretteri", "Оқуған azamat", "Kokserek", the play Enlik-Kebek and the stories "Kyly zaman", epics "Abay Zholy".	3					**v**									
		BD	EC	Abay studies	**Goal:** Preservation of the "national code" in the project "Kazakhtan" based on the work of A. Kunanbaev **Contents:** Historical review of the history of Kazakhstan and Kazakh literature of the 19th-20th centuries. Studies of the heritage of Abai in the XX-XXI centuries. Chronology of Abay's creativity. Abai is a great poet, ethnographer, founder of Kazakh written literature. Abay is the compiler of the Code of Laws “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". "Words of edification" of Abai, epic novel by M. Auezov "The Way of Abai". K.	3					**v**									

					Tokaev "Abai and Kazakhstan in the XXI century", role, significance.														
		BD	EC	Fundamentals of artificial intelligence	**Objective:** To develop competencies in the use of knowledge and practical application of artificial intelligence tools and methods, in alignment with the priorities of the AI-Sana program. **Contents:** Introduction to Artificial Intelligence (AI). Development of practical skills and abilities, including: using AI tools; working with large language models (LLMs); utilizing no-code AI platforms; employing generative AI tools; image recognition; natural language processing (NLP); and data visualization through AI. Understanding the application of AI in various fields and exploring its potential through the integration of AI-Sana program approaches.	3													**v**
		BD	EC	Basics anti-corruption culture	**Goal:** Formation of an anti-corruption worldview, strong moral foundations of the individual, citizenship, stable skills of anti-corruption behavior. **Content:** 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 from its manifestations, the ability to reasonably defend one's position, and look for ways to overcome manifestations of corruption. Application of AI in combating corruption	3					**v**								

6	Module of communications and physical culture	GED	GC	Kazakh (Russian) language	**Goal:** 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. **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 and domestic, social cultural, educational and professional, simulated 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.	10		**v**									**v**		
7		GED	GC	Foreign language	**Goal:** 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 European Competence, if the language level at the start is higher than the level B1 of the Common European Competence. **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.	10		**v**									**v**		
8		GED	GC	Physical Culture	**Goal:** Formation of social and personal competencies and the ability to Goalfully use the means and methods of physical culture,	8		**v**									**v**		

					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. **Contents:** Implementation of physical culture and health and training programs. A complex of general developmental and special exercises. Sports (gymnastics, 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.																
9		BD	UC	ProfessionalKazakh (Russian) language	**Goal:** Providing professionally oriented language training for a specialist who is able to adequately build communication in professionally significant situations and who knows the norms of the language for special Goals. **Contents:** Professional language and its components. Professional terminology as the main feature of the scientific style. Scientific vocabulary and scientific constructions in educational and professional and scientific and professional fields. Algorithm of work on the analysis and production of scientific texts in the specialty. Production of scientific and professional texts. Fundamentals of business communication and documentation in the framework of future professional activities.	3	**v**													
10		BD	UC	Professionally oriented foreign language	**Goal:** "Professional-oriented foreign language" is the formation of foreign language professionally oriented communicative competence among students, which allows them to integrate into the international professional environment and use professional English as a means of intercultural and professional communication.	3	**v**											**v**	**v**	

					Content: A professionally-oriented approach to teaching a foreign language at non-linguistic faculties of universities ensures the formation of students' ability to communicate in specific professional, business, scientific fields and situations, taking into account the characteristics of professional thinking, when organizing motivational, incentive-oriented research activities.														
11		GED	GC	Information and Communication Technologies	**Purpose:** knowledge of computer systems, software. **Content:** development of skills in using information resources for searching and storing information, working with spreadsheets, working with databases. Application of methods and means of information protection; design and creation of websites, multimedia presentations. Skills in using e-government and electronic textbooks, various cloud mobile technologies, SMART technology management.	5			**v**		**v**									
12	Natural science foundations of the specialty	BD	UC	Physics	**Goal:** Formation of knowledge of physical laws and skills of their application in engineering and production technology, development of scientific thinking based on an interdisciplinary approach. **Contents:** The laws of classical and modern physics (mechanics, molecular physics, thermodynamics, electromagnetism, optics, quantum and atomic physics). Application of knowledge of physical phenomena and processes for solving applied and technical problems. Scientific research methods, methods for processing and analyzing the results of theoretical and experimental research.	4									**V**	**v**			
13		BD	UC	Algebra and geometry	**Goal:** to give future engineers a certain amount of knowledge in mathematics, which is necessary both for studying related engineering disciplines and for special courses; develop mathematical intuition and the ability to apply the studied mathematical methods in solving applied problems related to the student's future specialty.	4					**v**								

					Content: The basic fundamental concepts of linear algebra and analytic geometry are explained. Owns the mathematical apparatus of the theory of matrices, determinants and systems of linear equations, vector algebra, analytic geometry, theory of lines and surfaces of the second order. Skills in solving applied problems in the field of ICT in the implementation of methods of protection against threats.														
14		BD	UC	Mathematical analysis	**Goal:** Development of logical thinking and mathematical culture of students necessary for the study of other mathematical disciplines. **Contents:** Set theory. Real numbers and how to work with them. The concept of a function. Domain of definition and values of the function. Plotting a function. Function types. Numeric sequences. Determining the limit of a sequence and a function. Theorems on the limits of a function. Limit of a monotonic function. Definition and properties of continuity of a function. Arithmetic operations on continuous functions. Continuity of elementary functions. Definition of the product of a function. Derivative table.Differential. Basic formulas and rules of differentiation. Invariance of the differential form. Derivatives of higher order. Leibniz formula. Higher order differentials. Fermat's theorem. Approximation formulas. Investigation of functions with the help of a derivative.	4					**v**					**v**			
15		BD	EC	Introduction to the specialty	**Goal:** to form an idea of the future specialty, development prospects and features of professional training in the specialty; knowledge in the field of modeling and building natural reality, applicable to perception and creativity; the use of information resources and software and hardware, the necessary motivation for self-learning and development is developed. **Contents:** Introduction and architecture of computer systems. Software. Human interaction with computers. Database systems. Database	4		**v**	**v**										

					management. Forming an idea of a future specialty in the field of modeling and construction of natural reality														
		BD	EC	Fundamentals of Academic Writing	**Goal:** Acquisition and strengthening of writing and critical thinking skills necessary for the effective study of special disciplines, design and writing of abstracts, reports, essays, and various student papers in accordance with accepted standards and norms of academic writing. **Content:** The basics and principles of conducting scientific discourse, the rules and features of design, generally accepted standards and norms for writing student papers of various types, the concept and types of substyles in an academic text are studied. The principles of analysis of a linguistic article, morphological, stylistic and lexical features of the scientific style are considered. The skills of analyzing, compiling and editing the text of articles, reports and reports, preparing annotations, term papers, substantiating relevance, setting a task are instilled.	4		**v**									**v**	
16		BD	EC	Mathematical Analysis 2	**Goal:** Formation of fundamental concepts of mathematical analysis among students, develop skills in solving and applying improper integrals. **Contents:** Concepts of an improper integral of the first kind and its convergence. Improper integrals of the second kind and its convergence criterion. Reduction of an improper integral of the second kind to an improper integral of the first kind. Integrals depending on a parameter. Euler integrals as examples of non-elementary functions. Closed and complete orthonormal systems in Euclidean space. The simplest conditions for uniform convergence and term-by-term differentiation of the trigonometric Fourier series.Double Riemann integral on a rectangle for an arbitrary region. Reduction of the double integral to the repeated single integral. The Riemann integral on an n-dimensional rectangular parallelepiped and on an	5		**v**				**v**			**v**				

					arbitrary domain. Improper multiple integrals.														
17		BD	EC	Logic programming	**Goal:**To be able to analyze the methods of logical programming on examples of compiling and debugging programs in Prolog, demonstrating the declarative and procedural properties of this algorithmically complete programming language. **Contents:** Algorithms and programs. The basis of logic programming. Prolog language objects, data types. Standard I/O, window systems. Repetitive calculations, lists. Graphic tools. Control simulation, sound predicate. Application programs**.**	5		**v**								**v**			
		BD	EC	Functional programming	**Goal:**To master the features of a functional programming language. Learning the algorithm of functional programming languages. Application of the acquired theoretical knowledge in the transformation of predicate calculus formulas - programming skills using the functional programming language. **Contents:** Generations of languages programming. General information about the functional approach to programming. Strictly functional language. Fundamentals of functional programming in Haskel. Functions. Correspondence between functional and imperative programs.	5		**v**								**v**			

18		BD	UC	Algorithmization and programming	**Goal:** mastering the skills of developing algorithms, methods and technology for solving practical and scientific problems in the Python language (1st level) **Contents:** PC software. The concept of an algorithm. Basic structures of algorithms. Methods for describing algorithms. Linear structure algorithms. Branching structure algorithms. Cyclic structure algorithms. Operations of the Python language. Linear structure programs. Branching structure programs. Lists. Strings. Tuples. Working with a function. Recursion. two-dimensional arrays. Sets. Dictionaries. Modules. Working with files. Graphic arts.	5		**v**			**v**								
		BD	UC	Educational practice	**Goal:** Formation of understanding and knowledge of the classification of programming languages, the concept of data types, operations and operators of the Python language, the principles of developing programs for solving problems in the Python language. Formation of practical skills in developing programs using functions, strings and files, processing symbolic information in the Python language. **Contents:** Python language. Data types, operations, operators. I/O features. Built-in object types: Numbers Strings Tuples Lists Dictionaries Sets. Fileinput Output. Reading lines with file iterators. Working with binary files. The numpy library for implementing mathematical objects and calculations. Creation of applications with GUI. Overview of graphics libraries: Tkinter, PyQT. Classes in Python.	1			**v**		**v**				**v**				
19		BD	UC	Object Oriented Programming	**Goal:** Formation of in-depth knowledge and skills in programming in the Python environment (2nd level) **Contents:** Classes and objects. Inheritance, polymorphism, encapsulation, abstraction of functions and variables. Multiple inheritance and visible variable scope. Connecting to a SQLite	5					**v**		**v**			**v**			

					database. Creating database queries within the program. Creating and making changes to the database through the program console. Displaying the database through the application. Design patterns; working with databases, application development.														
20		BD	EC	Application of IT in mathematics	**Goal:** Formation of knowledge, skills for solving a wide class of mathematical problems and the possibilities of computer modeling using the MathcadPrime package. **Contents:**Basic methods of working in the Mathcad Prime environment. Using matrix functions and operators in Mathcad Prime. Symbolic calculations in Mathcad Prime. Calculation of derivatives, integrals and matrices. Symbolic calculations with matrices. Solving systems of linear equations in Mathcad. Solving a system of linear equations using the lsolve function. Optimization functions in Mathcad Prime. Examples of using curve fitting and smoothing functions. Programming in the Mathcad Prime environment. Plotting functions in Mathcad.	4			**v**		**v**	**V**							
		BD	EC	Applied skills in Matlab	**Goal:** Acquisition of practical knowledge, skills for solving applied problems using the integrated MATLAB software package. **Contents:** Interface Matlab. Principles of work in the Matlab environment. Application of functions and operators in the Matlab software package. Carrying out symbolic calculations in the Matlab environment. Working with matrices in the Matlab environment. Methods for calculating integrals and derivatives. SLU solution in Matlab environment. Solving optimization problems using the Matlab package. Programming in the Matlab environment. Graphic capabilities of the integrated software package Matlab. Organization of program structures using program control operators. Registration of	4			**v**		**v**	**v**							

					MATLAB modules in the form of script files and function files.														
23		PD	EC	Fundamentals of mathematical modeling	**Goal:** Acquisition of skills for the implementation of models of processes of different nature and the establishment of their results of adequacy to the process under study**.** **Contents:** Classification of mathematical models. Semantics of the problem statement. Basic principles of creating mathematical models. The use of fundamental laws of natural science as the basis of mathematical modeling. Analytical models. statistical models. Deterministic and stochastic models. Methods and features of mathematical modeling of various processes. Stages of modeling. Methods for the implementation of mathematical models: analytical, approximate-analytical and numerical methods. Methodology for the selection and use of sections of the mathematical apparatus in mathematical modeling. Methods for establishing the adequacy of mathematical models.	4				**v**		**v**			**v**					
	Process Modeling Module	PD	EC	Introduction to Mathematical Modeling	**Goal:** Study of the basic concepts, principles and methods of mathematical modeling. Acquaintance with technologies for constructing and researching mathematical models of physical, biological, economic, social systems. **Contents:** Application of computer mathematics systems to the study of mathematical models. Numerical methods for solving ordinary differential equations. Physical problems leading to ordinary differential equations and their systems. Problems of biology, economics, sociology, leading to ordinary differential equations and their systems.	4				**v**		**v**			**v**					
24		BD	EC	Business Process Simulation Technology	**Goal:** Familiarization of students with the mathematical principles of the formation of simulation models and the application of these principles in the construction of simulation models of various economic systems and processes. Possession of skills in developing	4		**v**				**v**			**v**					

					computer models and conducting experiments with them that allow solving problems of estimating and optimizing the parameters of complex systems. **Contents:** Theoretical foundations of simulation modeling. Modern systems of simulation modeling of general and special purposes. Computer implementation of system models.														
		BD	EC	Simulation modeling in the AnyLogic environment	**Goal:** Mastering such basic developments of simulation models based on various approaches as system dynamics, discrete-event and agent-based modeling. The discipline "Simulation in the AnyLogic environment" involves the introduction of knowledge about modern technologies of simulation modeling of systems in the AnyLogic environment for planning and managing the implementation of solutions. **Contents:** Theoretical foundations of simulation modeling. Modern systems of simulation modeling of general and special purposes. Computer implementation of system models.	4		**v**				**v**			**v**				
25		PD	EC	Virtual simulation of physical processes	**Goal:** Understanding the basic concepts and definitions of models of physical processes; basic physical laws and their application to create virtual models of various processes. Ability to create an adequate model of the system and analyze the influence of various parameters on the behavior of a virtual system. Apply the acquired knowledge in the development and debugging of effective algorithms for solving physical problems. Evaluate ways to visualize solutions to problems in the environment of computer (virtual) mathematical systems **Contents:** Solving Equations. Solution of systems of equations. Solution of differential equations. Least squares and regression analysis. Fundamentals of computer modeling. Method of molecular dynamics. Basics of working with programs for visualization and packages for modeling molecular dynamics. Information	5				**v**		**v**					**v**		

					models and computer experiments in physics. Information models in physics. The concept of computer simulation. Automation of a physical experiment and processing of experimental results. Solving problems using software packages. The concept of the fundamentals of mechanical engineering and modeling of engineering design.														
		PD	EC	Fundamentals of modeling physical processes	**Goal:** Study and understanding of the basic mathematical methods, research in solving physical problems and in processing experimental data. Own various types of implementation on a PC, evaluate the errors in the results of calculations. The application of practical skills develops basic mathematical algorithms in modeling physical properties, as well as in identifying a numerical model of real physical phenomena. **Contents:** Solution of equations. Solution of systems of equations. Solution of differential equations. Least squares and regression analysis. Fundamentals of computer modeling. Method of molecular dynamics. Basics of working with programs for visualization and packages for modeling molecular dynamics. Information models and computer experiments in physics. Information models in physics. The concept of computer simulation. Automation of a physical experiment and processing of experimental results. Solving problems using software packages. The concept of the basics of engineering modeling	5				**v**		**v**					**v**			
26		PD	EC	Mathematical and computer modeling of immersive technologies	**Goal:** Use of mechanisms and patterns in the development of conceptual and theoretical models of scientific problems to be solved and tasks for designing VR / AR. Application of modern methods of mathematical and computer modeling for solving problems of operation of immersive technologies. **Contents:** Linear approximation of statistical data. Quadratic approximation of statistical data.	5						**v**			**v**		**v**		

					Model of normally distributed random variables. Numerical solution of the Cauchy problem for ordinary differential equations. Numerical solution of a boundary value problem for ordinary differential equations.														
		PD	EC	Fundamentals of Immersive Technology Modeling	**Goal:** To study the theoretical aspects of modeling virtual and augmented reality technologies. Formation of skills and abilities of modeling the hardware and software components of the formation of immersive content with varying degrees of immersion in the virtual space. Practical skills are used to establish the adequacy of mathematical models of VR objects using experimental data in the process of performing individual and group tasks. **Contents:** Approaches to the creation of immersive technologies. Augmented Reality, Virtual Reality and Mixed Reality.	5						**v**			**v**		**v**		
27		PD	EC	Development of virtual games	**Goal:** To form students' general professional and professional competencies. To form a complex of information technology knowledge among students. To acquaint students with various ways and technological methods of creating content for a game engine, for virtual and augmented reality applications; with the latest trends in the development of multimedia technologies and solutions to the set design tasks. **Contents:** Digital sculpting. Setting up an individual 3D model to work in the game engine. The technological process of creating game elements and augmented/virtual reality in the Unity environment.	5					**v**			**v**					
		PD	EC	Technology for creating virtual games	**Goal:** To master interaction with the virtual world to intensify learning processes. To master the technological aspects of the implementation of virtual reality systems: special devices, stages of creating virtual reality systems, its components, 3D graphics for modeling environments, objects, characters, software tools (engines) for control model interactively in real time.	5					**v**			**v**					

					Contents: History of development virtual reality technologies. Contemporary VR equipment. Application areas: features of interaction with content. Problems and risks. Video 360. Philosophical and psychological aspects of the development of new media and virtual worlds														
28		BD	EC	Virtual Research of Technology Process	**Goal:** Understanding the modern possibilities of designing simple software algorithms using modern programming tools, analyzing technological processes and equipment as objects of automation and control, drawing up structural diagrams of production, their mathematical models as control objects, determining criteria for the quality of functioning, developing algorithms for centralized control of the coordinates of the technological object. **Contents:** Methods of the theoretical level of virtual research of technological processes. Methods of the empirical level of virtual research of technological processes. Methods of experimental-theoretical level of virtual research of technological processes. Special methods of virtual research of technological processes.	6					**v**					**v**	**v**		**v**
		PD	EC	Virtual Reasearch of Industrial Safety Problems	**Goal:** Understanding and understanding of modern possibilities for designing simple software algorithms using modern programming tools, analyzing technological processes and equipment as objects of automation and control, drawing up structural diagrams of production, their mathematical models as control objects, determining criteria for the quality of functioning, developing centralized control algorithms technological object coordinates. **Contents:** Methods of the theoretical level of virtual research of technological processes. Methods of the empirical level of virtual research of technological processes. Methods of experimental-theoretical level of virtual research of technological processes. Special methods of	6					**v**					**v**	**v**		**v**

					virtual research of technological processes.														
29		PD	EC	Network technologies	**Goal:** Study of the basic concepts, logical and physical principles of building computer networks and telecommunications; principles of interaction between computers and network equipment at the hardware and software levels; acquiring knowledge of network technologies and skills that can be applied at the beginning of work as a network specialist; formation of competencies related to the functioning of computer networks; mastering the principles of interaction between network elements, methods for calculating and building networks based on typical equipment and software. **Contents:** Logical networking. Physical networking. Network structuring. International network standards. Networks of the standard. 802.3. Organization of wireless networks 802.11a, b, g, n. Introduction to global networks. Network information protection technology.	4		**v**		**v**								
		PD	EC	Network operating systems	**Goal:** Gaining knowledge on the basic principles of building modern operating systems (OS) and the features of their application, the ability to configure specific OS configurations, choose an OS for solving information processing tasks, skills in working with various OS and their administration. **Contents:** Functions of operating systems. operating system structure. Utilities and programs. software processes. File management and I/O operations. Network interaction algorithms.	4		**v**		**v**								
30		PD	EC	Mobile Application Development	**Goal:** Formation of knowledge on the basic device of the Android mobile platform and programming on Android. **Contents:** Architecture of mobile devices and their components. Operating systems for mobile devices. Java for mobile devices. JavaME.	4		**v**												**v**

					Configurations and profiles in JavaME. Android programming. Android library. Java Virtual Machine in Android; creation of applications for Android OS; AndroidSDK and third-party development; installing tools, compiling and installing Android applications. Features of the Android ecosystem. Features of developing applications for Windows Phone.														
		PD	EC	Cloud computing technologies in business	**Goal:** Development of skills for the use of modern cloud computing technologies in professional activities. **Contents:** General concepts of cloud technologies. Cloud solutions. Fundamentals of cloud computing. Cloud services provided by companies. Electronic presentation and GOOGLE spreadsheets for networking. Cloud Computing in JAVA. Academic cloud service. Building a private cloud. Installing OWNCLOUD cloud storage on a local web server. Access to the cloud from a local network in a domain created on OpenServer. Virtualization technologies. virtualization platforms. Virtual machines. Configuring Hyper-VWINDOWSSERVER.	4		**v**	**v**											
31		PD	UC	Web service development (JavaEE)	**Goal:** Formation of knowledge on modern methods of programming WWW-applications on the JavaEE platform. **Contents:** Introduction to WEB-programming. Fundamentals of server technologies. Server programming languages and development environments. Development of applications based on the database. Client technologies of WEB-programming: HTML, JavaScript, CSS. Modern WWW-application model. CMS control systems. WEB services. Cloud technologies. A review of modern methods of SEO (search engine optimization) to improve the promotion of developed Web sites and Web applications on the Internet.	5									**v**	**v**		**v**	
32		PD	UC	Field trip II	**Goal:** Knowledge and understanding of the elements of mathematical and computer	6			**v**		**v**				**v**				

					modeling in terms of making specific production decisions and their implementation. Application of practical skills in installing network operating systems, working with the Internet and network technologies to solve production problems. Making report. **Contents:** Introduction to the technology of computer mathematical modeling. Computer mathematical modeling in physics. Differential or finite-difference formulations of a number of models of physical processes. Examples of problems leading to the formulation of a general linear programming problem.														
33		BD	UC	Python programming language	**Goal:** Formation of understanding and knowledge of the classification of programming languages, the concept of data types, operations and operators of the Python language, the principles of developing programs for solving problems in the Python language. Formation of practical skills in developing programs using functions, strings and files, processing symbolic information in the Python language. **Contents:** Python language. Data types, operations, operators. Input/output features. Built-in object types: Numbers Strings Tuples Lists Dictionaries Sets. file input Output. Reading lines with file iterators.Working with binary files.Numpy library for implementing mathematical objects and calculations.Creating GUI applications.Overview of graphics libraries: Tkinter, PyQT. Classes in Python.	4					**v**				**v**	**v**			
	Fundamentals of programming and databases Graphical tools in modeling and information protection	BD	EC	Distributed systems in Python	**Goal:** To study issues related to distributed applications and their areas of application. Assessing basic knowledge of Python technologies for implementing distributed applications. Application of acquired knowledge for solving practical problems. Learn how to implement common Python applications. Practical skills in working with tools and methods for building and organizing distributed	4					**v**				**v**	**v**			

					systems. **Contents:** Basic concepts. Distributed systems and distribution models divided calculations. Principles and standards for creating open distributed systems. Distributed application architecture, multitasking operating systems. Protocols and intermediate environments. Customer relationship management and server. Messaging services. Web Services. Windows Communication Technology foundation. Methods for managing distributed data storage.														
34		BD	EC	Programming technology	**Goal:** the acquisition by students of fundamental theoretical and practical knowledge in the process of studying the basics of programming technology in the C# language (1st level) **Contents:** Programming technology. Introduction to the C# programming system. Expressions and assignments. C# language operators. Conditional operator. Loop operators. Precondition operator. Postcondition operator. An operator with a parameter. foreach statement. One-dimensional arrays. two-dimensional arrays. Procedures are methods of a class. Functions are class methods. Strings. Graphic arts. Classes. Files.	5									**v**	**v**	**v**		
35		PD	EC	Pattern recognition systems	**Goal:** Knowledge of systematic reviews of existing methods of pattern recognition in various systems, to study and master the ways of their application for information processing and pattern recognition. **Contents:** Methods of computational intelligence. Methods of intellectual processing and analysis of images. Neural networks. Theory of decision making.	5												**v**	**v**
		PD	EC	Pattern recognition and image processing	**Goal:** Formation of knowledge on the methodology for developing algorithms for image recognition and processing **Contents:** Basic laws and provisions of the	5					**v**				**v**	**v**			**v**

					theory of pattern recognition: conceptual foundations of approaches and methods of pattern recognition; algorithms used in the analysis of images, acoustic signal or other types of sensors; linguistic analysis or machine learning; ways of digital representation of images. Development of skills in applying the methods of spatial and spectral image processing; mathematical models used to evaluate image quality.														
36		BD	UC	Database management systems	**Purpose:** Formation of knowledge about the organization and functioning of the database and skills to work with the database **Contents:** Basic concepts, database organization, data models; functions of the database management system; modern technologies of data storage, data retrieval, query languages; technologies and software for database design; mathematical database model based on Codd algebra; Descriptions of basic operations in the language of relational algebra. Development of the client and server parts of distributed databases using modern DBMS.	5			**v**		**v**				**v**			**v**	
37		BD	UC	Field trip I	**Objective:** Knowledge and understanding of the design and management of databases, Case technology tools and other database management systems. Formation of practical skills and core competencies in: specialty; drawing up algorithms and programs for tasks that arise in the process of studying profile disciplines; solving professional problems related to the activities of practice bases; development of mathematical and computer models, processes related to the activities of enterprises (base) practices. **Contents:** Introduction. Physical design of the database. Logical database design. Designing relational databases using normalization. Client-server organization of data. Database protection.	4									**v**	**v**	**v**	**v**	

38		BD	UC	3D modeling	**Purpose:** Understanding and understanding of the principle of work in the 3DStudioMAX software package, composition and structure, the use of multimedia hardware and software, as well as the construction of animation models. Evaluation of methods and acceptance of work on a three-dimensional scene. Formation of practical skills in the use of professional graphic and graphic editors in professional activities based on 3DStudioMAX. **Contents:** Basic concepts of 3D modeling. Basics of working in the Blender, SolidWorks, AutoCAD 3D editors. Fundamentals of animation of 3D models. Modeling of interactions of physical objects. Fundamentals of animation of 3D models. Automation of work in the 3D editor using the BlenderPythonAPI.	4	v						**v**	**v**				**v**	
	Graphical tools in modeling and information protection Modern technologies and models in specialization	BD	EC	3D design	**Purpose:** Formation of skills in modern graphic editors, creation of three-dimensional models. **Contents:** Basic facilities for creating objects. Modification and editing of objects or their individual elements. Fundamentals of three-dimensional computer graphics in professional activities. Combining the created objects into functional groups. Construction of simple three-dimensional models of real objects. Basics of working in the Blender.	4	v						**v**	**v**				**v**	
39		BD	EC	Technologies for the development of digital twins	**Purpose:** Understanding the features of digital twins; knowledge of program solutions adopted in the Concept; Highlight the problems of the spread of dual digital devices in the world. The ability to characterize and evaluate the stages of work of ordinary twins, factors of digital twin technologies. Apply technical means of collecting and collecting data on digital twins. Formation of digital samples and work with them on the platform of digital twins of production. Formation of practical skills on the issue of artificial intelligence as a tool for ensuring the efficiency of digital twins. **Content:** The concept of digital twins. Linear	5				**v**		**v**	**v**					**v**	**v**

					modeling of processes and systems. Differential modeling of processes and systems. Modeling with the use of data analysis and artificial intelligence technologies. Queuing systems and Petri nets. Simulation modeling of processes and systems. Modeling using CAD/CAM/CAE systems. Modeling using geoinformation systems. Controlling organization processes using digital twins.														
		BD	EC	Cryptographic methods of information protection	**Purpose:** mastering the theoretical foundations of cryptographic protection of electronic information, as well as the formation of practical skills in the use of symmetric and asymmetric cryptographic systems **Contents:** The concept of cryptography. Types of encryption. Permutation ciphers. Simple substitution ciphers. Encryption of information using a complex replacement algorithm. Encryption by gamma method. Block encryption systems. Stream encryption systems. Asymmetric cryptosystems. Digital signature schemes. cryptographic protocols. Hash functions and message authentication. Control keys.	5				**v**		**v**	**v**					**v**	**v**
40	Modern technologies and models in specialization Special courses at the choice of the department	PD	EC	Fundamentals of Smart technologies	**Purpose:** formation of students' competencies in the field of creating projects on programmable logic controllers. Study by students of the main programming languages for programmable logic controllers. Obtaining practical skills in developing programs for programmable logic controllers. **Contents:** Programmable Logic Controllers. Programmable logic controller ILC 131 Starterkit. PLC design using tools oriented to the languages of the International Electrotechnical Commission (IEC) standard. Description of the PC WorX programming environment.				**v**	**v**									
		PD	EC	Data analysis based on the Statistica software package	**Purpose:** Formation of scientific and theoretical knowledge in the field of analysis of statistical data and processes, practical skills and abilities	5			**v**	**v**										

					for the automated solution of related computational problems in the framework of improving the culture of thinking. **Contents:** Basic provisions of automated processing and analysis of statistical data. Descriptive statistics and operations on statistical data. Evaluation of the presence of dependence between variables. Laws of distribution of random variables and their properties; Statistical contingency tables and their analysis. Time sequences of statistical values and their characteristics. Method of autoregression and moving average (ARMA). Mathematical models of statistical processes. Multiple regression. Purpose and characteristics of the software package Statistica. Organization of the working environment and user interface. Toolkit and functionality. Calculation of typical characteristics of statistical data and time sequences.															
41		PD	EC	Machine learning in IT	**Purpose:** Mastering the theoretical foundations of machine learning. Developing practical skills in working with data. Training in working with popular machine learning libraries such as TensorFlow, Keras, Scikit-learn and others. Developing and optimizing models. Using machine learning in various IT areas. **Contents:** General formulation of the problem of learning from precedents. Machine learning methods. Classical problems solved using machine learning. Types of input data during training. Types of quality functionals. Using AI in machine learning.	6			**v**		**v**								**v**
		PD	EC	AI in virtual systems	**Purpose:** Creation and optimization of virtual agents. Study of methods that allow creating virtual agents (characters, robots, NPCs) with adaptive behavior, independence and efficiency in solving problems. Integration of AI into virtual and augmented realities. Solving optimization and decision-making problems. **Contents:** Introduction to artificial intelligence.	6		**v**				**v**							**v**

					Fundamentals of virtualization. AI methods used in virtualized systems and study of machine learning algorithms for optimizing the operation of virtual systems. Creation and configuration of virtual systems using AI.														
42		BD	EC	Multimedia and virtual reality systems	**Purpose:** Possession of the skills of software implementation of real-life systems in compliance with the requirements of the equipment, taking into account the biopsycho-parameters of the user. Demonstrate the ability and willingness to apply knowledge in the design of VR systems, import 3D models into VR / AR development. **Contents:** Visualization and interaction devices for immersive environments. Development of augmented reality applications. Development of virtual reality applications. Development of high performance virtual and augmented reality applications.	4	v												
	Special courses at the choice of the department Module for acquiring new professional competencies	BD	EC	Information technology of virtual reality	**Purpose:** To form an introduction about the variety of implementation of real technologies and how to use them. Assess the degree of demand for IT of natural reality in various fields of human activity. Formation of practical skills in the application of information technologies of real reality. **Contents:** Visualization and interaction devices for immersive environments. Development of augmented reality applications. Development of virtual reality applications. Development of high performance virtual and augmented reality applications.	4		**v**										**v**	
43		BD	EC	Modeling algorithms for objects of natural reality	**Purpose:** Mastering the methods of analysis of system algorithms. Evaluation and justification of the choice of representations of geometric models and algorithms for their occurrence. Carrying out simulation of algorithms and analysis of its results. Formation of practical skills in the field of natural reality modeling. **Contents:** Technology of modeling algorithms for objects of natural reality. Characteristics of	5		**v**										**v**	

					modeling algorithms for objects of natural reality. Designing or upgrading the modeling of algorithms for objects of natural reality.														
		BD	EC	Maintenance of virtual reality projects	**Goal:** Understanding and knowledge of the basic concepts of equipment, leading companies developing VR projects, platforms for developing AR applications. Ability to apply and evaluate development stages: choice of environment taking into account the characteristics (mobile application, industrial or corporate context), choice of tools, design development, coding (display, interaction, support), testing. Practical skills are applied as part of the technology for developing an AR application in Unity. **Contents:** Algorithmization and programming, Object-oriented programming, 3D design, 3D modeling, Virtual research of industrial safety problems, Simulation modeling in the AnyLogic environment, Virtual reality information technologies, Modeling of algorithms for virtual reality objects, Fundamentals of AR object production technology, Platforms for creating VR/AR content. Applied technologies of virtual reality, Development of virtual reality applications, Maintenance of virtual reality projects, Technologies for the development of digital twins, Virtual reality in education, Virtual modeling of physical processes, Mathematical and computer modeling of immersive technologies	5			**v**									
44		BD	EC	Web development with Unity	**Purpose:** To form an understanding of the importance of programming and design in the development of interactive applications; know the basic techniques of programming in C # and working in Unity; be able to implement the full development cycle of an interactive application using the Unity development environment; be able to use professional tools for developing interactive applications in Unity. **Contents:** Introduction to game development on				**v**									

					Unity. Scripting in Unity. Ishader materials. Optimization developed application and preparation for implementation.														
		BD	EC	Web development on Unreal Engine	**Purpose:** To form the student's theoretical knowledge and practical skills in working with technologies of virtual and augmented reality (AR and VR) in the field of mass communication, immersive journalism; the formation of the student's comprehensive general professional and professional competencies in the field of virtual and augmented reality technologies (AR and VR). **Contents:** Project planning and prototyping. Thinking through and implementation of the project architecture and its individual components. Implementation of the user interface. Debugging and bug fixing. Working with assets and graphics.					**v**									
45		BD	EC	Disciplines for additional educational program	**Purpose:** Formation of theoretical knowledge and practical skills for solving problems in a set of disciplines to obtain additional competencies in a chosen area that is not a core one. **Content:** An additional educational program (Minor), which defines a set of disciplines and (or) modules and other types of educational work determined by the student in order to form additional competencies in a selected area that is not a core one; individualization of students' education, increasing students' motivation.	12	v		**v**								**v**		
	Final assessment module	PD	UC	Undergraduate or industrial practice	Develops the ability to: correctly represent the structure of the practice base, describe the production processes of the enterprise; discuss the use of software products, computer equipment of the enterprise; analyze the technical condition, production process, measures to ensure life safety; offer own developments, create virtual reality applications on the instructions of the enterprise for implementation in production;Understanding and application of system concepts: to determine the problem under study in the course of the	8				**v**	**v**	**v**							

					thesis; collecting material; subject area and construction of mathematical and computer models of virtual reality; compiling technical documentation for the developed VR / AR systems. Practical skills are applied in the development and implementation of VR/AR systems. **Contents:** Basic principles of organization of work at the enterprise. Pre-project inspection of the automation object. Collection of indicators and coefficients for calculating the costs of developing an information system. Information system design. Working design (implementation). Testing and implementation.															
	Final assessment module			Writing and defending a thesis, graduation project or preparing and passing a comprehensive exam	Knowledge and understanding of the methods of conducting research of an object in order to collect the necessary materials for the development of a mathematical model. Conducting analysis of components for the development of mathematical and computer models. Practical skills are used to develop databases of a mathematical model; writing program code and debugging it. With this work, students show that they have the ability to independently present complex computer scientific technical problems and their relationship with other industries, to combine and apply the acquired knowledge of software tools, programming systems, information technologies in their further work and professional activities.	12	v											**v**	

5. SUMMARY TABLE SHOWING THE VOLUME OF DISPUTED LOANS BY EP MODULES

Course of Study	Semester	Number of modules being mastered	Number of disciplines studied			Number of KZ credits					Total hours	Total loans KZ	Quantity	
			GC	UC	EC	Theoretical training	Physical Culture	Educational practice	Production, undergraduate practice	final examination			exam	diff. offset
1	1	4	4	1		28	2				900	30	6	1
	2	4	1	3	1	26	2	2			900	30	5	3
2	3	4	1	2	5	28	2				900	30	6	2
	4	5	2	1	2	24	2		4		900	30	5	2
3	5	5		1	6	30					900	30	6	1
	6	4			4	24			6		900	30	3	1
4	7	4		1	3	20					600	20	4	-
	8	3		1	3	20					600	20	4	-
	9	1		1					8	12	600	20	-	1
итого		15	8	11	24	200	8	2	18	12	7200	240	39	11

6. STRATEGIES AND METHODS OF TRAINING, MONITORING AND EVALUATION

Learning Strategies	**Student-centered learning:** the learner is the center of teaching/learning and an active participant in the learning and decision-making process. **Practice-oriented learning:** focus on the development of practical skills.
Teaching methods	Conducting lectures, seminars, practical and laboratory work with: • application of innovative technologies: • problem-based learning; • case study; • work in a group; • discussions and dialogues, intellectual games, competitions, quizzes; • software development; • presentations; • rational and creative use of information sources: • multimedia training programs; • electronic textbooks; • virtual laboratory work; • digital resources. Organization of independent work of students, individual consultations.
Monitoring and assessing the achievability of learning outcomes	**Current control** on each topic of the discipline, control of knowledge in the classroom and outside the classroom (according to the syllabus). Assessment Forms: • Poll in the classroom; • Testing on the topics of the academic discipline; •Test papers; • Protection of independent works; • discussions; • trainings; • colloquia; • essays, etc. **Midterm control** at least twice during one academic period within one academic discipline. **Intermediate certification** is carried out in accordance with the working curriculum, academic calendar. Conduct forms: • exam in the form of testing; • oral exam; • a written exam; • combined exam; • defense of term papers; • protection of practice reports. **Final examination.**

7. Educational and resource support for EP

Information Resource Center	The structure of the OIC includes 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The network infrastructure of the JRC is based on 180 computers with Internet access, 110 workstations, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4 format scanners, set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system. The library fund is reflected in the electronic catalog available to users on the site http://lib.ukgu.kz on-line 24 hours 7 days a week. 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 http://articles.ukgu.kz/ru/pps. 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", "SKSU in Print", "Readers" "SKU". The JIC 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 JIC; through the information network of the university for faculties and departments; remotely on the library website http://lib.ukgu.kz/. Open access to international and republican resources: SpringerLink, Plenipotentiary, WebofScience, EVSCO, Epigraph, electronic versions of scientific journals in open access, Zan, RMEB, Adebiet, Aknurpress Digital Library , "Smart-kitar", "Kitar.kz", etc. For people with special needs and disabilities, the library website has been adapted to the work of visually impaired users
Material and technical base	**Specialized Audiences:** Computer classes and lecture halls equipped with modern functional and presentation equipment. Modern hardware and licensed software are installed in computer classes. All laboratory rooms are equipped with new generation computers that are in working order, allow for scientific and laboratory work, and are used in full. The computers are connected to a local network and connected to the high-speed network of the university. Lecture rooms are equipped with computers, multimedia projectors, which allow teaching at a high level. **Laboratory instruments and installations** **Standard kit** - "Molecular Physics" (Processing the results of multiple direct measurements, Maxwell's Pendulum) - Installation "Electricity and Magnetism" (Modeling, Determination of the specific charge of the Electron by the method of the magnetron, Hall effect) Standard kit

	- "Optics" (Dispersion, Diffraction, Polarization, Interference) - Installation for studying the electro-hole transition - Installation to study the external photo effect - Installation for determining the resonant potential of an atom of an inert gas (mercury) with an oscilloscope - Installation for determining the width of the sealing layer P-n junction and impurity concentration in the region of avalanche breakdown **- Devices and equipment**

Brief description of the enterprise and the profile of its activities

The implementation of the proposed EP will be carried out on the basis of the Higher School of «Computer engineering and Energy» NAO South Kazakhstan University. M. Auezov. The university is the leading multidisciplinary university in the Turkestan region. Responsible for the implementation of the educational program is determined by the graduating department " Information and Communication Technologies ".

1. **Relevance and relevance of the EP**

The educational program 6B06141 - "Virtual Reality Modeling and Construction" was created in accordance with the needs of the regional labor market in personnel with higher professional education. In the context of the formation and development of professionally oriented education, the problem of training highly qualified personnel for the implementation of managerial and analytical functions in the field of modeling and designing virtual reality becomes relevant. Currently, the information space of the region is increasing the number of business objects, medical, educational and government, research organizations that need to develop, implement and maintain VR/AR systems. This circumstance imposes certain obligations on higher education institutions in terms of training personnel.

1. Learning outcomes and competencies, their relationship with the demands of the labor market

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

1. The presence of components that develop practical skills

The academic disciplines of the EP provide the formation of the necessary practical skills of a specialist with fundamental and applied knowledge in the field of mathematical and computer modeling, design and maintenance of virtual systems, who own modern methods of collecting, storing and processing information used in his professional activities.

All practice programs are developed taking into account the requirements of the professional standard, as well as taking into account the opinion of employers. The types of practices included in the educational program are determined in accordance with the types of activities to which the educational program is oriented. Their content, goals and objectives testify to the orientation of the educational program towards the development of practical skills and abilities of students.

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

The modules "Modern technologies and models in specialization", "Special courses at the choice of the department" introduced disciplines that contribute to the formation of the competence of a modern specialist in the areas of application of virtual reality technologies. The disciplines of the curriculum for the peer-reviewed EP form the entire necessary list of general cultural, general professional and professional competencies.

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

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

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

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

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

1. Quality of the modular guide

The content of the modular reference book of the educational program corresponds to the accepted competence model of the graduate. The composition of educational modules covers all relevant areas of training specialists in the field of modeling and designing VR/AR systems.

2. Conclusion on the OP

Based on the foregoing, I consider it possible to assert that the goals and content of the presented educational program correspond to modern qualification requirements for the training of bachelors specializing in the field of modeling and designing virtual reality.

Director of “INNOVA Corporation company LLP” Turdaliev Zh.K.

Approval sheets

6B06141-Virtual Reality Modeling and Construction

According to the educational program

Director DAA&QEP_____Naukenova A.C.
Signature

Director DASc _____Nazarbek U.B.
Signature

REVIEW
for the educational program
6B06141-"Virtual Reality Modeling and Construction"

(code and name)

developed in the NJSC "SKU im. M. Auezov, Shymkent

Brief description of the enterprise and the profile of its activities

The implementation of the proposed educational program will be carried out on the basis of the NAO South Kazakhstan University named after. M. Auezov. Yuku them. M. Auezov is one of the brightest brands of higher education in the republic. Responsible for the implementation of the EP is the graduating department "Information and Communication Technologies" of the Higher School of «Computer engineering and Energy».

1. Relevance and relevance of the EP

The educational program 6B06141 - "Virtual Reality Modeling and Construction" was developed with the active and systematic involvement of employers and students. The content of the EP, its goals, expected learning outcomes, planning of the educational process, competencies are created in accordance with the needs of the regional labor market in personnel with higher professional education. Taking into account the needs of the labor market and the prospects for its development, highly qualified engineers, specialists in the development, implementation and maintenance of VR / AR systems will be in demand among IT specialists.These specialists will be in demand in various areas of business, education, medicine, in government agencies, as well as in research organizations. In this regard, the development and implementation of this EP is relevant and in demand.

2. Learning outcomes and competencies, their relationship with the demands of the labor market

The learning outcomes and competencies proposed in the EP contribute to the formation of theoretical, practical knowledge and skills, and also fully cover the modern qualification requirements for specialized specialists with a bachelor's qualification.

3. The presence of components that develop practical skills

In the educational program, there is a focus on the expected learning outcomes: competencies, competencies and practice orientation. The learning outcomes correspond to the graduate's competency model according to professional competencies.

Thecontent, goalsandobjectivesoftheeducationalprogramarefocusedonthedevelopmentofpracticalskillsandabilitiesofstudents.

I believe that the practical skills formed by students in this EP contribute to the provision of training of qualified, competitive personnel that meet modern requirements for the quality of specialists with higher education for independent work in the direction of modeling and designing virtual reality.

4. Content of the educational program (modules, disciplines)

The structure of this educational program, based on a modular principle, contains learning outcomes and competencies: key and professional.

The content of the educational program is focused on innovative (distance, interactive, etc.) learning technologies, various categories of students, as well as inclusive education.

The disciplines of the curriculum for the reviewed EP form the entire necessary list of general cultural, general professional and professional competencies.

The structure and content of the EP is made taking into account the requirements of employers, as well as the individual abilities and needs of students.

The requirements for the volume of the study load, measured in credits mastered by him during the academic year for each academic discipline or type of study work, have been met. The distribution of disciplines by modules, the volume of the study load is rational and logically justified.

The content of the disciplines of the elective component takes into account the specifics of the socio-economic development of the region and the needs of the labor market, the established research areas of the Higher School of «Computer engineering and Energy», as well as the individual interests of the student himself.

The disciplines of the university component take into account the specifics of the requirements for professional competencies (qualification characteristics, qualification requirements), established scientific schools at the University.

The content of the disciplines corresponds to the competence model of the graduate.
In general, the educational program has a logical and consistent structure.

5.Quality of the modular guide

The quality of the modular reference book of the peer-reviewed educational program corresponds to the accepted competence model of the graduate. The content of educational modules covers all relevant areas of training specialists in the field of modeling and designing VR/AR systems.

6. Conclusion on the OP

Evaluation of the peer-reviewed educational program in terms of its relevance, content meet the qualification requirements for the training of bachelors specializing in the field of modeling and designing virtual reality.

Director of “INNOVA Corporation company LLP” Turdaliev Zh.K.

Expert opinion
for the educational program
6B06141 - "Virtual Reality Modeling and Construction"

1. Relevance of the OP

The relevance of this educational program is determined by the widespread use of virtual reality modeling and design technologies across various fields of modern society.

The rapid development of interactive multimedia technologies requires the emergence of specialists of a new formation. In Kazakhstan, there is a significant shortage of specialists who are able to create and successfully operate modern digital technologies in the field of modeling and designing virtual reality systems. Due to the dynamic development of the industry and the rapid obsolescence of information technology, constant updating and improvement of educational programs in this area is required.

The educational program corresponds to current regional labor market trends and takes into account new and transforming professions identified in the Regional Professions Map.

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

The educational program 6B06141 - "Virtual Reality Modeling and Construction" formulates: the concept of the educational program, the goals and objectives of training specialists, the requirements for the organization of the educational process and for applicants, the learning outcomes of the EP, and also contains a description of the qualification characteristics of the graduate of the educational program, his key and professional competencies, information about disciplines.The list of academic disciplines and their content meet the modern qualification requirements for specialists in the field of "Modeling and designing virtual reality".

The selection of academic disciplines, the laid down requirements for the formed knowledge, practical skills and professional competencies are fully consistent with the mission of the university "Formation of the country's intellectual elite based on the generation of new knowledge and the transformation of the university into an entrepreneurial university", meet the needs of employers and students.

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

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

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

The educational program is aligned with the Dublin descriptors, the 2nd cycle of the Qualifications Framework of the European Higher Education Area (A Framework for Qualifications of the European Higher Edication Area), the 6th level of the European Qualifications Framework for Lifelong Learning.

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

The structure and content of the EP correspond to the requirements of the classifier of areas for training personnel with higher education of the educational program 6B06141-"Virtual Reality Modeling and Construction".

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

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

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

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

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

The composition of educational modules covers all relevant areas of training of highly qualified specialists in the field of mathematical and computer modeling, competitive in the domestic and international labor markets.

7. The presence in the EP of components for preparing for professional activities that develop key competencies, intellectual and academic skills, reflecting the changing demands of society, including the implementation of the presidential program for mastering three languages: Kazakh, Russian and English

The program examines the technological aspects of the implementation of virtual and augmented reality systems: specialized devices, stages of creating VR / AR reality systems, their components, 3D graphics for modeling environments, objects, characters, software tools for managing the model in an interactive real-time mode. Presented for the consideration of the OP is made qualitatively, competently. What is important is its focus on the unity of theory and practice, the focus on training a competent specialist in the field of modeling and designing virtual reality. The included academic disciplines cover the entire range of topical issues and problems in the training profile, are fully capable of forming the necessary specialized knowledge, skills and abilities in the field of mathematical and computer modeling of VR systems.

8. The logical sequence of disciplines and the reflection of the main requirements in the curricula and training programs

Disciplines by academic periods are placed in a logical sequence. Structural parts of the educational program: interconnected, aimed at achieving the planned result, successive, disclosed in full.

The content of the disciplines of the educational program corresponds to the accepted competence model of the graduate.

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

In order to train highly qualified specialists, all types of educational activities are provided. The planned volume and time resource for academic disciplines and types of training meet the qualification requirements for the level of graduates, and also contributes to the comprehensive satisfaction of their educational needs.

The methodological equipment of the educational program contributes to the successful solution of problems in key areas of training, education and development of students.

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

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

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

The educational program provides for three types of practice: training in the amount of 2 credits, industrial practice I in the amount of 4 credits, industrial practice II in the amount of 6 credits and pre-diploma in the amount of 8 credits.

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

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

12. Qualification obtained as a result of mastering the EP

Upon mastering the EP, the graduate will be awarded the qualification of a bachelor in the field of digital technologies in the educational program 6B06141-"Virtual Reality Modeling and Construction"

13. Recommendations

In accordance with the foregoing, it seems possible to assert that the objectives and content of the EP correspond to modern qualification requirements for the training of bachelors specializing in digital technologies.

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

Chairman of the expert committee:

Dean of the HS «CE&E», Professor of t. s, Ajibekov K.J.

Members of the committee:
Head of the Department of «Automation,
Telecommunications and Control» c.t.s., docent Musabekov A.A.
PHD, Associate Professor of the Department «Information
systems and Modelling» Ismailov H.B.