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AGREED

Chairman of the educational and methodological council of JSC "MUIT"

_____ A.K. Mustafina

«19» 03 2024

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APPROVED

Chairman of the Board-Rector JSC "International University of information technologies"

A.K.Khikmetov

«27» 03 2024

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EDUCATIONAL PROGRAM

6B06118 «Immersive technologies»

Code and classification of the field of education: 6B06 - Information and Communication Technology

Code and classification of training area: 6B061 - Information and Communication Technology

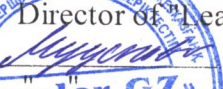Group of educational programs: B057 - Information Technology

ISCED level: 6

NQR level: 6

ORC level: 6

Duration: 3 years

Number of credits: 240

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AGREED

Director of "Leader GZ" LLS

_____ A.A.Mudanova

_____ 2024

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AGREED

Director of "KADEEN" LLS

_____ Zh.K.Daniyarov

_____ 2024

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Almaty, 2024

Content

List of abbreviations and designations

BC	Basic competence
BM	Base module
HE	Higher education
SCES	State compulsory education standard
EQF	European qualification framework
EEF	European Education Foundation
KSC	Knowledge, skills, cum-savvy
NCO	National Classification of Occupations
NQF	National Qualifications Framework
NQS	National qualifications system
HM	Humanitarian module
CM	Common module
EP	Educational program
GPM	General Professional Module
IQF	Industry Qualifications Framework
PS	Professional standard
PE	Postgraduate education
PC	Professional competence
PM	Professional module
SW	Software
WG	Working group
RK	The Republic of Kazakhstan
LO	Learning outcome
SM	Special module
QMS	Quality Management System
SEM	Socio-economic module
TVE	Technical and vocational education
TaVPE	Technical and vocational education and post-secondary education
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO	Specialized agency of the United Nations Educational, Scientific and Cultural Organization
Cedefop	European Center for Development of Vocational Training
DACUM	from Eng. Developing curriculum
ECVET	European Credit System for vocational education and training
EQAVET	European Quality Assurance in Vocational Education and Training
ENQA	European Association for Quality Assurance in Higher Education / Europe-Skye association by to ensure qualities at higher education
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
FIBAA	International Agency (non-profit foundation) for accreditation and examination of the quality of higher education (Bonn, Germany)
IQM-HE	Internal Quality Management in Higher Education
TACIS	Technical Assistance for the Commonwealth of Independent States
WSI	WorldSkills International

1 Description of the educational program

The educational program 6B06118 "Immersive Technologies" (Immersive Technologies) is designed to implement the principles of the democratic nature of education management, expanding the boundaries of academic freedom and the powers of educational institutions, which will ensure the adaptation of the system of technical and vocational education to the changing needs of society, the labor market economy. The flexibility of the program will take into account the abilities and needs of the individual, production and society.

The educational program ensures the application of an individual approach to students, the transformation of professional competencies from professional standards and qualification standards into learning outcomes. At the same time, student-centered learning is carried out - the principle of education, which implies a shift in emphasis in the educational process from teaching to learning.

A graduate of this educational program will have the following skills, such as programming, prototyping modern XR systems, creating 3D models, special effects, animations, a user-friendly interface, optimizing and building applications using XR technologies, compiling design documents that reflect the work of future applications, artistic design.

The field of professional activity of graduates are public and private enterprises and organizations that develop, implement and use computer equipment and software in various fields, namely: telecommunications, science and education, healthcare, agriculture, engineering, metallurgy, transport, in the service sector, administrative management, economics, business, management of various technologies, that is, in almost all areas of human activity.

2 Purpose and objectives of the educational program

The purpose of the EP is to train highly qualified specialists with such skills as programming, prototyping modern XR systems, creating 3D models, special effects, animations, user-friendly interface, optimizing and building applications in XR , compiling design documents that reflect the work of future applications, artistic design . Applications include industrial quality control, medical imaging, geodesy, robotics, multimedia systems, virtual heritage, film and television special effects, and computer games.

Tasks of the OP:

1. Prepare a universal specialist who has knowledge in mathematics, ICT, computer science; с is able to use modern information and communication technologies in substantive activities.

2. To teach students how to formalize the subject area of a software project and develop specifications for software product components.

3. To develop students' ability to design software architecture and ensure a high level of continuity and quality of complex software developments.

4. To teach students how to design and develop user interfaces, commercial software components, databases, and embedded software modules.

5. To acquaint students with the methods and tools for studying the software code to identify / eliminate errors and malfunctions in the operation of the software.

6. To instill in students the skills to check compliance with specifications and indicators of performance and efficiency of integrated systems, as well as to design, construct and test components of a software product.

7. To teach students the basic techniques for creating and editing images in vector editors and the skills of editing photorealistic images in raster editors.

8. Apply modern information technologies to create artistic and design and design and technological solutions by means of computer graphics.

9. Apply modern information technologies to create artistic and design and design and technological solutions by means of computer graphics.

10. Use the basic laws of natural sciences in professional activities and operate modern electronic equipment and information and communication technologies in accordance with the goals of the bachelor's educational program.

11. Own methods of formal description, algorithms and software tools for the implementation of interactive software and hardware systems.

12. Analyze the prospects and directions for the development of the gaming industry.

13. Possess the skills of software implementation of multimedia systems, virtual, augmented and mixed reality using various equipment.

14. Use the main practical approaches, due to modern business processes, to the design of complex information security systems of varying degrees of complexity, depending on the nature of the object of protection.

15. Apply modern information technologies to create artistic and design and design and technological solutions by means of computer graphics.

16. Use knowledge of modern problems of science and education in solving educational and professional problems.

17. Navigate in the field of computer processing and obtaining animated images, justify the choice of software tools for solving specific problems, use the main software, technical and applied systems of computer animation.

18. Apply modern technologies and methodologies for receiving, storing, transmitting, processing big data.

19. Use modern visualization tools and technologies - the methodology for conducting design, pre-project and other creative and analytical studies, is able to apply these techniques in professional activities.

3 Requirements for evaluating the learning outcomes of an educational program

After mastering the educational program, the student must:

- Demonstrate the ability to use basic mathematical tools.
- Apply various tools for developing software, user interface and data storage and processing systems.
- Explain the execution of programs in a high-level language at the instruction level; use a wide range of memory technologies, internal and external;
- Write code to manipulate bits in a processor.
- Solve practical problems by creating programs in a good style, as well as modifying and rewriting the created program using analysis tools, development environment (s) for creating and debugging applications, modern compiler environments.
- Explain written program documentation and write documentation using operation diagrams, class diagrams, state diagrams, entity relationship (ER) diagrams. Be able to develop models of the logical and physical architecture of a software system.
- Design logical database schemas using relational, object-oriented, object-relational, key-value schemas for simple and complex defined systems.
- Understand the software development life cycle, different software development methodologies and the place of testing in this process.

- Able to create test cases and form test kits, develop and write acceptance tests, test scripts, document the defects found.
- Have the skills to select, design, implement, evaluate the quality and analyze the effectiveness of software for solving problems in various subject areas.
- Independently diversify and critically analyze modern sources, draw conclusions, argue them and make decisions based on information.
- To know the methods and means of computer graphics and geometric modeling, the basics of vector and raster graphics, the theoretical aspects of fractal graphics, the basic methods of computer geometry, the algorithmic and mathematical foundations of constructing realistic scenes, the implementation of computer graphics algorithms using a computer. (Basics of computer graphics)
- Know the concept and structure of the computer games industry, the history and classification of computer games. Be able to form the concept of a computer game, present the concept of a computer game. Have the skills to analyze the structure of a computer game.
- Be able to apply technologies, methods and tools for processing big data.
- Know and be able to apply in practice the basic mathematical models in the field of specialization.
- Be able to choose visualization methods and scenarios that are adequate for the subject area and the problem under study and effectively apply visualization tools to solve applied problems.
- To know the basic concepts and trends in the protection of computer information, the principles of information protection, the principles of classification and examples of security threats to computer systems, modern approaches to the protection of information technology products and systems implemented in current domestic and international IT security standards, the main tools for ensuring multi-level security in information systems.

4. Passport of the educational program

4.1 General information

№	Field name	Note
1	Code and classification of the field of education	6B06 – Information and Communication Technologies
2	Code and classification of areas of study	061 – Information and Communication Technologies
3	Group of educational programs	B057 – Information technology
4	Name of the educational program	6B06118 «Immersive Technologies» (Immersive technologies)
5	Brief description of the educational program	The educational program "Immersive Technologies" is dedicated to the unity of technology and creative creative thinking. Within its framework, students will get acquainted with a wide range of subjects, ranging from the basics of algorithmization and programming, including project management skills. This direction will allow developing not only applied skills, but also the so-called soft skills, which are no less in demand among IT sector specialists in the 21st century. Students will get acquainted with the behavioral patterns of the user, understand how exactly it is necessary to use this data when developing interactive systems in augmented reality.

		The educational program "Immersive Technologies" includes basic courses in applied and social sciences, humanities, as well as a wide range of professional courses in digital media.
6	Purpose of the EP	Training of highly qualified specialists for innovative and high-tech industries in the field of computer graphics, image processing, visualization, computer vision, virtual and augmented reality, video processing, image recognition, human-computer interaction, machine learning and digital libraries. Applications include industrial quality control, medical imaging, geodesy, robotics, multimedia systems, virtual heritage, special effects in film and television, and computer games.
7	Qualification characteristics of an EP graduate:	**The field of professional activity of a graduate of the EP:** The field of professional activity of EP 6B06118 "Immersive Technologies" are public and private enterprises and organizations that develop, implement and use computer equipment with graphic elements and software in various fields, that is, in almost all spheres of human activity.
		Objects of professional activity of graduates of EP: The objects of professional activity of graduates of EP 6B06118 "Immersive Technologies" are industrial quality control, processing and visualization of medical images, geodesy, robotics, multimedia systems, virtual heritage, special effects in cinema and television, as well as computer games.
		The subject of professional activity of an EP graduate: The subjects of professional activity of a bachelor in EP 6B06118 "Immersive Technologies" are organizations such as telecommunications, science and education, healthcare, agriculture, mechanical engineering, metallurgy, transport, service sector, administrative management, economics, business, management of various technologies.
		Types of professional activity of a graduate of the EP: - programming - prototyping of modern XR systems - - creating 3D models - creation of special effects - - creating animations - creating a user-friendly interface - optimization - build applications using XR technologies - preparation of design documents - artistic design.
		The functions of the professional activity of a graduate of the EP: - designing the architecture BY;

		- interface development - construction - testing of components - creating images - editing - visualization
8	ISCED level	6
9	NQF level	6
10	ORC level	6
11	List of competencies of the educational program: OK1: The ability to be competent in choosing mathematical modeling methods for solving specific engineering problems, including the willingness to identify the natural science essence of problems that arise in the course of professional activity, and the ability to involve the appropriate physical and mathematical apparatus to solve it. OK2: Know: social and ethical values based on public opinion, traditions, customs, social norms and focus on them in their professional activities; traditions and culture of the peoples of Kazakhstan; human and civil rights and freedoms; fundamentals of the legal system and legislation of Kazakhstan; trends in the social development of society; bases of physical culture and principles of a healthy way of life of the person. OK3: Have an idea: about ethical and spiritual values; about sociological approaches to the individual, the main patterns and forms of regulation of social behavior; about the essence of power and political life, political relations and processes, about the role of political systems in the life of society and various social groups; about the role of consciousness and self-consciousness in the behavior, communication and activities of people, the formation and development of personality. OK4: Possess: ethical and legal standards of behavior; a system of practical knowledge and skills that ensure the acquisition, development, improvement and activation of psychophysical abilities and qualities, the acquisition, preservation and strengthening of health, the ability to work in a team, correctly defend one's point of view, and offer new solutions. OK5: Ability for written and oral communication in the state language and the language of international communication; the ability to logically correctly, reasoned and clearly build oral and written speech; readiness to use one of the foreign languages QC1. The ability to use modern information and communication technologies in objective activities. QC2. Able to formalize the subject area of a software project and develop specifications for software product components. QC3. Able to design software architectures and ensure a high level of continuity and quality in complex software developments. QC4 Able to design and develop user interfaces, commercial software components, databases and embedded software modules. QC5. Capable of verifying compliance with specifications and indicators of performance and efficiency of integrated systems, as well as designing, constructing and testing software product components. QC6. Familiar with applicable software, modules, DBMS, programming languages, methods for extracting knowledge from data and developing client-server database applications. QC7. Explain the principles and patterns of the historical development of society, know your role in the development of information technology, strive for self-improvement. QC8 To master the basic techniques for creating and editing images in vector editors and the skills of editing photorealistic images in raster editors.

	QC9 Ability to use the basic laws of natural sciences in professional activities and operate modern electronic equipment and information and communication technologies in accordance with the goals of the bachelor's educational program. QC10 To master the methods of formal description, algorithms and software tools for the implementation of interactive software and hardware systems, to analyze the prospects and directions for the development of the gaming industry.
12	LO1. Demonstrate the ability to use basic mathematical tools. LO2. Apply various tools for software development, user interface and data storage and processing systems to ensure the software life cycle. LO3. Explain the execution of programs in a high-level language at the instruction level; use a wide range of memory technologies, internal and external; Write code to manipulate bits in a processor. LO4. Design logical database schemas using relational, object-oriented, object-relational, key-value schemas for simple and complex defined systems. LO5. Understand the software development life cycle, different software development methodologies and the place of testing in this process. LO6. Have the skills to select, design, implement, evaluate the quality and analyze the effectiveness of software for solving problems in various subject areas. LO7. Independently diversify and critically analyze modern sources, draw conclusions, argue them and make decisions based on information. LO8. To know the methods and means of computer graphics and geometric modeling, the basics of vector and raster graphics, the theoretical aspects of fractal graphics, the basic methods of computer geometry, the algorithmic and mathematical foundations of constructing realistic scenes, the implementation of computer graphics algorithms using a computer. LO9. Be able to choose visualization methods and scenarios that are adequate for the subject area and the problem under study and effectively apply visualization tools to solve applied problems. LO10. To know the basic concepts and trends in the protection of computer information, the principles of information protection, the principles of classification and examples of security threats to computer systems, modern approaches to the protection of information technology products and systems implemented in current domestic and international IT security standards, the main tools for ensuring multi-level security in information systems.
13	Form of study	Full-time
14	Languages of instruction	English
15	Volume of loans	240
16	Awarded Academic Degree	Bachelor in Information and Communication Technologies in the educational program 6B06118 "Immersive Technologies" (Immersive Technologies)
17	Professional standards	Graphic and multimedia design development Testing multimedia applications (including computer games)
18	Atlas of new professions	VR/AR/MR Editor/Designer Developer/VR/AR/MR Design Engineer VR/AR/MR operator
19	Developer(s) and authors:	T.T. Chinibayeva, PhD, Head of the Department of CE Ermekova D.E., senior lecturer

4.2 Matrix for correlating the learning outcomes of the educational program with the competencies being formed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
QC1	V	V	V							
QC2					V					
QC3			V							
QC4			V	V						
QC5						V			V	
QC6					V	V				
QC7							V	V	V	
QC8							V			V
QC9	V									

4.3 Requirements for evaluating the learning outcomes of an educational program

The following forms of exams are used as an assessment of learning outcomes: computer testing, written exam (answers on sheets), oral exam, project (passing a course project), practical (open questions on a computer, solving problems on a computer, including in ACM format), complex (test/written/oral+others). According to table 1, the following ratio of exam forms is recommended:

№	Exam form	Recommended share, %
1	Computer testing	10%
2	Written	10%
3	Verbal	5%
4	Project	30%
5	Practical	30%
6	Comprehensive	15%

5. Information about disciplines

No.	Title of the discipline	Brief description of the discipline	Number of credits	Formed competencies (codes)	Prerequisites	Postrequisites
		Cycle of general education disciplines Required component				
1.	History of Kazakhstan	The course examines the modern history of Kazakhstan as part of the history of mankind, the history of Eurasia and Central Asia. The modern history of Kazakhstan is a period in which a holistic study of historical events, phenomena, facts, processes is carried out, identifying historical patterns that took place on the territory of the Great Steppe in the twentieth century and to the present day.	5	LO10, LO2, LO3, LO4, LO5, LO6	No	No
2.	Philosophy	The object of study of the discipline is philosophy as a special form of spiritual pursuits in its cultural and historical development and modern meaning. The main directions and problems of world and domestic philosophy are studied. Philosophy is	5	LO10, LO2, LO3, LO4, LO5, LO6	No	No

		a special form of knowledge of the world, creating a system of knowledge of the general principles and foundations of human life, about the essential characteristics of man's relationship to nature, society and spiritual life, in all its main directions.				
3.	Foreign language	The course includes an intensive English language program focusing on grammar and speaking skills. The course includes topics that reflect the latest developments in information technology, and the vocabulary makes them directly relevant to the needs of students.	10	LO7, LO2, LO3, LO4, LO5, LO6	No	No
4.	Kazakh (Russian) language	The course occupies a special place in the system of training bachelors with engineering education. For students of a technical university, studying professional Kazakh/Russian languages is not only the improvement of skills acquired at school, but also a means of mastering a future specialty.	10	LO5, QC7	No	No
5.	Information and communication technologies	The course examines information and communication technologies as modern methods and means of communication between people in ordinary and professional activities using information technologies for searching, collecting, storing, processing and disseminating information.	5	QC1, LO1	No	No
6.	Sociology - Political science	The course includes knowledge of sociological subject areas, research methods and directions. The course will discuss in detail the main sociological theories and the most effective ways to gain in-depth knowledge about various aspects of our modern society. The particular importance of this course for students is to develop the sociological imagination, to understand the basic concepts of sociology as a science. The course focuses on general political knowledge for ICT majors. Includes political self-awareness, improvement of one's political outlook and communication competencies. Political knowledge teaching is communicative, interactive, student-centered, results-oriented, and relies heavily on student independent work.	4	LO2, LO3, LO4, QC7	No	No
7.	Cultural studies - Psychology	The course will help become the basis for studying the entire complex of social sciences and humanities, as well as an addition to general courses in history and philosophy. The course includes topics such as morphology, semiotics, anatomy of culture; culture of the nomads of Kazakhstan, cultural heritage of the proto-Turks , medieval culture of Central Asia, the formation of Kazakh culture, Kazakh culture in the context of globalization, cultural policy of Kazakhstan, etc. This course presents issues of psychology in a broad educational and social context. The knowledge, skills and abilities acquired and developed as a result of mastering the course content give students the opportunity to apply	4	LO2, QC7	No	No

		them in practice in various spheres of life: personal, family, professional, business, social, in working with people - representatives of different social groups and age categories . The course is also designed to develop bachelors' ideas about the factors that complicate teaching activities at the present stage of social development, and about the difficulties specific to this activity.				
8.	Physical Culture	The course is devoted to the formation of personal physical culture and the ability to purposefully use various means of physical culture to preserve and improve health.	8	LO2	No	No
9.	Economics and organization of production	New trends in economics and production organization are discussed with examples from real life and practice. The structure of the national economy, enterprises and the organization of its production are considered.	5	QC2	No	No
10.	Research metodology	The course is devoted to the study of activities aimed at developing students ' ability to independent theoretical and practical judgments and conclusions, skills of objective evaluation of scientific information, freedom of scientific research and the desire to apply scientific knowledge in educational activities, including for the diploma project (work).	5	GC1	Cult urol ogy-Psyc holo gy	Diplo ma desig n
11.	Economic theory	The course goal is to study and explain processes and the phenomena of economic life, and for this purpose it should get into an essence of deep processes, explain laws and predict ways of their use.attempts to provide comprehensive coverage of all the key elements in the discipline	5	GC1	Cult urol ogy-Psyc holo gy	Diplo ma desig n
12.	Basics of Financial Literacy	The course «Basics of Financial Literacy» is aimed at gaining knowledge and skills in the field of personal finance management. As part of the course, students will learn how to use all kinds of financial tools in practice, protect and increase savings, plan a budget competently, gain practical skills in calculating and paying taxes, and correctly filling out tax reports, learn how to analyze financial information and navigate financial products to choose an adequate investment strategy.	5	GC1	no	Diplo ma desig n
13.	Fundamentals of law and anti-corruption culture	Studying ways of safe human interaction with the environment (industrial, domestic, urban, natural), sustainable operation of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies and the use of modern means defeat. Also the course reveals the role of ecology in solving modern economic, social and political problems, as well as the emergence of global environmental problems as a result of human production activities and the responsibility of	5	GC1	Socio logy-Politi cal Scien ce	Diplo ma desig n

		the world community for them. A very important aspect is also international cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.				
14.	Startups and entrepreneurship	This course provides an introduction to what a business is, how it works and how to run it. Students will define ownership and processes used in manufacturing and marketing, finance, personnel, and management in business operations.	5	GC1	no	Diploma design
15.	Fundamentals safety of life activity and ecology	Studying ways of safe human interaction with the environment (industrial, domestic, urban, natural), sustainable operation of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies and the use of modern means defeat. Also the course reveals the role of ecology in solving modern economic, social and political problems, as well as the emergence of global environmental problems as a result of human production activities and the responsibility of the world community for them. A very important aspect is also international cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.	5	GC1	no	Diploma design
Cycle of basic disciplines **University component**						
16.	Optics	The discipline "Optics" is devoted to the study of the properties and phenomena associated with the propagation, interaction and refraction of light. In this discipline, students deepen their knowledge of fundamental concepts of optics, including beam and wave optics, diffraction, interference, and polarization. They also study the applications of optical phenomena in various fields such as medicine, telecommunications, photography, and the design of optical systems and devices. The course includes both theoretical and practical aspects of optics to enable students to better understand and use light phenomena in various fields of science and technology.	5	QC2	Physics	No
17.	Physics	Study the basic laws of classical mechanics, special relativity, electromagnetic phenomena, quantum mechanics, thermodynamics in search of ways to solve physical problems	5	QC2 QC9	No	No
18.	Algebra and geometry	Knowledge of mathematical apparatus in the form of matrices, integrals, linear dependencies is the basis of this discipline. In addition, students deepen their knowledge in algebraic operations, solving equations, and explore geometric objects and their properties. This discipline provides fundamental mathematical	4	QC2 QC9	No	No

		skills and applications in various fields.				
19.	Information theory	As part of this discipline, students will study the transmission, storage and processing of information. She explores concepts such as entropy, encoding and data compression and helps optimize information transfer in various fields including information technology, communications and cryptography	5	QC2 QC9	No	No
20.	Algorithmization and programming	The course is designed to provide basic knowledge of a programming language (C++). Students are taught basic algorithms in C++. The course also contains if / else structures and loops. Arrays, functions and pointers are the main topics. Students will write programs in a procedurally oriented language. Search, sorting and recursive algorithms will be discussed in detail.	5	QC3	No	No
21.	Mathematical analysis	In this discipline, students will learn methods of function and sequence analysis to model and understand continuous processes and changes.	4	QC2 QC9	No	No
22.	Theory of Probability and Mathematical Statistics	In this subject, students will learn the analysis of random events and data, used to estimate probabilities, predict outcomes and make informed decisions.	4	QC2 QC9	No	No
23.	Discrete Math	Solve combinatorial problems, explore types of mappings and binary relations, reduce propositional algebra formulas to normal forms, apply the algebra of logic to the theory of switching circuits, use the basic properties of quantifiers to transform mathematical formulas, demonstrate the ability to analyze and synthesize, and correctly formulate the result.	4	QC2 QC9	No	No
24.	Educational practice	Basics of programming	2	QC1 QC3,	No	No
25.	Internship	Gaining production experience in solving industrial problems in the field of software development	7	QC1 QC3,	No	No
26.	Undergraduate practice	Collection and analysis of materials for writing a diploma project	5	QC2	No	No
27.	Unity Basics	The course is devoted to studying the Unity platform for creating interactive 2D and 3D applications and games. Includes basic programming, creating graphic and sound effects, managing animation, and interacting with the game world.	5	QC3 QC6	Algorithmization and programming	No
28.	Object-oriented programming	Apply object-oriented programming concepts in software development	5	QC3	Algorithmization and programming	No
29.	Web technologies	Be able to use the PHP programming language, master the basics of the MySQL database and develop server-side client web applications	5	QC3 QC6	Application Development Basics, Algorithm	No
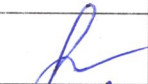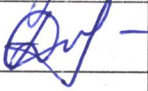
						izatio n and progr ammi ng	
30.	Software Architecture and Design	Within the framework of this discipline, students will learn to analyze the processes of design and development of software systems. Includes architectural design techniques, design patterns, principles for developing and testing software to ensure its reliability and efficiency.	5	QC3 QC6		Appli catio n Deve lopm ent Basic s, Algo rithm izatio n and progr ammi ng	No
31.	XR system design	This course is aimed at introducing the best practices for creating and designing mixed, virtual and augmented reality systems for developing and testing entertainment and information applications. Familiarization with the rules of interaction between the user's senses and extended reality systems will allow you to create applications that are comfortable and easy to interact with. The specifics of developing systems for various platforms and devices will also be studied.	4	LO10 QC1 QC10		ICT, Intro ducti on to Progr ammi ng, Psyc holog y	No
32.	Project management	Be able to use project management tools at various stages of the project life cycle, make qualitative and quantitative assessments of project risks, and determine the effectiveness of the project Collaborative software development. Version control, planning, development process stages	5	QC3 QC4 QC5 QC6		Appli catio n Deve lopm ent Fund amen tals	No
33.	Introduction to AR/VR technologies	This course is focused on developing an understanding of virtual, augmented and mixed reality, basic concepts, relevance and prospects of these technologies, as well as the principles of operation of VR/AR devices.	5	QC10 QC1		ICT	No
34.	Database design. Introduction to SQL	Use modern database management systems to create databases	5	QC3, QC6		Algo rithm izatio n and progr ammi ng	No
35.	Graphic Design Basics	The discipline provides an introduction to the basic principles and concepts of graphic design. In this discipline, students study elements of design such as composition, color, typography, and visual arts. They also learn to apply these elements to create effective and attractive design solutions in a variety of media, including printed materials, websites, advertising, and multimedia projects. The	5	QC1 QC2		ICT, Appli catio n Deve lopm ent Fund amen tals	No

		course may also include an introduction to professional graphics tools and software.				
36.	Virtual simulation of physical processes	The discipline describes modern modeling methods for describing and analyzing the behavior of realistic nonlinear systems that are found in engineering and scientific disciplines. By developing and applying such methods and tools, students will gain a deep understanding of how various systems work, allowing them to more effectively implement XR into their own projects. Examples will be considered, including problems of micro- and nanoelectronics, bioengineering, materials science, and physics.	5	QC1 QC2	Theory of Probability and Mathematical Statistics, Mathematical analysis	Machine learning, computer graphics
37.	Artificial Intelligence Basics	The discipline is devoted to the study of the basic concepts, methods and algorithms of artificial intelligence. Students study machine learning, neural networks, natural language processing and other techniques used in creating intelligent systems.	5	QC1 QC2 QC3	Algebra and geometry, Mathematical analysis, Introduction to Programming	Computer vision
38.	Digital image processing	As part of this discipline, students will study methods for processing and analyzing digital images. They learn to enhance images, recognize objects in photographs, and apply this knowledge in medical, space and other fields.	5	QC1 QC2 QC3	Algebra and geometry, Mathematical analysis, Introduction to Programming	Processing systems
39.	Pattern recognition systems	This discipline is aimed at students mastering the basics and methods of classification and identification of objects, phenomena, processes, signals, situations, etc. objects that are characterized by a finite set of certain properties and characteristics.	6	LO1 QC1	Algebra and geometry, Mathematical analysis, Introduction to	Computer vision

						Progr amm i ng	
40.	Animation and visual effects	The discipline is aimed at using the principles of digital processing when shooting and editing animated films, forming basic ideas, knowledge, skills and abilities of students in the basics of computer animation and visual effects.	5	LO10 QC1 QC2 QC9		ICT	No
41.	Computer vision	Computer vision is a discipline that studies methods of reconstruction, interpretation of 3D scenes based on 2D images taking into account its structure and properties.	5	LO10 QC1 QC2		Obje ct- orien ted progr ammi ng	No
42.	HCI - UI/UX in AR/VR	This discipline studies the principles of developing interfaces for XR systems. Problems arising during interaction will be considered user with technology. Students will learn to shape this interaction in such a way that the connection of spaces where the flat digital world meets three dimensions is as organic as possible .	5	LO1 QC1		ICT, Fund amen tals of Grap hic Desi gn, Hum an- Com puter Inter actio n	No
43.	Virtual reality systems	The technological aspects of the implementation of virtual reality systems are mainly considered: special devices, stages of creating virtual reality systems, its components, 3D graphics for modeling environments, objects, characters, software tools (engines) for controlling the model interactively in real time.	6	LO1 QC1		ICT, Intro ducti on to AR/ VR techn ologi es, Algo rithm izatio n and progr ammi ng	Proce ssing syste ms

6. The curriculum of the educational program

Module code	Module name	Discipline cycle	Discipline component	Code of subject	Subject name	Academic credits	Academic study period	Exams	Differentiated test	Term paper/project	Total	Lectures	Laboratory trainings	Practice	Studio lessons	Practice	Independent work of students	Independent work of	1 course (1)	1 course (2)	2 course (3)	2 course (4)	3 course (5)	3 course (6)
General modules																								
Modules of specialty/education programm																								
Additional modules beyond qualification																								
Modules of choice																								
1		G E R	C S	LAN 6001 A	Foreign language	5	1	1			5/150			45			15	90	5.0					
2		G E R	C S	ICT6 001	Information and Communication Technologies	5	1	1			5/150	15	30.0				15	90	5.0					
3		G E R	C S	LAN 6002 A	Foreign language	5	2	2			5/150			45			15	90		5.0				
4		G E R	C S	PhC6 005	Physical Culture	4	2	2			4/120	15		120			0	0		4.0				
5		G E R	C S	SPS6 006	Cultural studies-Psychology	4	2	2			4/120	15		30			15	60		4.0				
6		G E R	C S	SPS6 007	Sociology-Political science	4	2	2			4/120	15		30			15	60		4.0				
					Number of weeks in the academic period														15	15	15	15	15	15

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№			Code	Course name												
7	G E R	C S	LAN 6001 KR	Kazakh (Russian) language	5	3	3		5/1 50	15	45		15	90		5.0
8	G E R	C S	PhC6 006	Physical Culture	4	3	3		4/1 20		12 0		0	0		4.0
9	G E R	C S	SPS 6001	Philosophy	5	4	4		5/1 50	15	30		15	90	5.0	
10	G E R	C S	LAN 6002 KR	Kazakh (Russian) language	5	4	4		5/1 50	15	45		15	90	5.0	
11	G E R	C S	HK6 002	History of Kazakhstan	5	4	4		5/1 50	15	30. 0		15	90	5.0	
12	G E R	E S	RM6 502	Research metodology	5	4	4		5/1 50	15	30		15	90	5.0	
13	G E R	E S	JUR 6507	Fundamentals safety of life activity and ecology					5/1 50	15	30		15	90		
14	G E R	E S	MGT 6706	Startups and entrepreneurship					5/1 50	15	30		15	90		
15	G E R	E S	JUR 6470	Fundamentals of law and anti-corruption culture					5/1 50	15	30		15	90		
16	G E R	E S	FIN6 720	Basics of Financial Literacy					5/1 50	15	30		15	90		
17	G E R	E S	ECO 6006	Economic theory					5/1 50	15	30		15	90		
18	B S	U C	MAT 6001	Algebra and Geometry	4	1	1		4/1 20	15	30		15	60	4.0	
19	B S	U C	SFT6 006	Algorithmization and Programming	5	1	1		5/1 80	15	15	30. 0	15	105	5.0	
20	B S	U C	SFT6 007	Web Technologies	5	1	1		5/1 50	15	30. 0		15	90	5.0	

№				Code	Discipline																			
21	B S	U C		EGR 6302	Information theory	5	1	1		5/150	15	30.0					15	90	5.0					5.0
22	B S	U C		SFT6 306	Software Architecture and Design	5	1	1		5/150	15	30.0					15	90	5.0					5.0
23	B S	U C		PHY 6001	Physics	4	2	2		4/210	15	30.0	30				15	120		4.0				
24	B S	U C		MAT 6002	Mathematical analysis	4	2	2		4/120	15	30.0					15	60		4.0				
25	B S	U C		MAT 6003	Discrete mathematics	4	2	2		4/120	15	30.0					15	60		4.0				
26	B S	U C		SFT6 002	Object oriented programming	5	2	2		5/150	15	30.0					15	90		5.0				
27	B S	U C		EP63 01	Educational practice	2	2			2/60					60	0	0			2.0				
28	B S	U C		MAT 6004	Probability theory and mathematical statistics	4	3	3		4/120	15	30.0					15	60			4.0			
29	B S	U C		EEC 6600	Optics	5	3	3		5/150	15	30.0					15	90			5.0			
30	B S	U C		SFT6 327	Fundamentals of Unity	5	3	3		5/150	15	30.0					15	90			5.0			
31	B S	U C		VRT 6388	Digital Image Processing	5	4	4		5/150	15	30.0					15	90				5.0		
32	B S	U C		IP63 05	Industrial practice	7	4	4		7/210					210	0	0				7.0		
33	B S	U C		PP63 04	Pre-diploma practice	5	6	6		5/150	15	30.0			150	0	0					5.0	
34	B S	U C		PM6 301	Project management	5	6	6		5/150	15	30.0					15	90					5.0	
35	B S	U C		SFT6 375	Fundamentals of artificial intelligence	5	6	6		5/150	15	30.0					15	90					5.0	
36	A S	U C		SFT6 305	Database Design. Introduction to SQL	5	1	1		5/150	15	30.0					15	90	5.0					
37	A S	U C		SFT6 381	Graphic Design Fundamentals	5	2	2		5/150	15	30.0					15	90		5.0				
38	A S	U C		SFT6 379	Introduction to AR/VR technology	5	3	3		5/150	15	30.0					15	90			5.0			
39	A S	U C		SFT6 382	Virtual modeling of physical processes	5	3	3		5/150	15	30.0					15	90			5.0			
40	A S	U C		SFT6 300	Design of XR systems	5	5	5		5/150	15	30.0					15	90						5.0

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№				Code	Course name																				
41	A S	U C		VRT 6384	Pattern recognition systems	6	5	5			6/180	30	30.0			15	105							6.0	6.0
42	A S	U C		SFT6 388	HCI - UI/UX in AR/VR	5	5	5			5/120	15	30.0			15	60						5.0	5.0
43	A S	U C		SFT6 385	Animation and Visual Effects	5	6	6			5/150	15	30.0			15	90							5.0
44	A S	U C		VRT 6387	Computer Vision	5	6	6			5/150	15	30.0			15	90							5.0
45	A S	U C		SFT6 389	Virtual reality systems	6	6	6			6/180	30	30.0			15	105							6.0
46	A S	E S		MIN 601	Minor 1	5	3	3			5/150	15	30.0			15	90			5.0				
47	A S	E S		EGR 6376	Computer and mathematical modeling	5	3	3			5/150	15	30.0			15	90			5.0				
48	A S	E S		SFT6 378	Introduction to Mashine Learning	5					5/150	15	30.0			15	90							
49	A S	E S		MIN 602	Minor 2	5	4	4			5/150	15	30.0			15	90		5.0					
50	A S	E S		VRT 6386	Technologies for the development of digital twins + BIM	5	5	5			5/150	15	30.0			15	90				5.0			
51	A S	E S		SFT6 376	Microsoft .NET Framework	5					5/150	15	30.0			15	90							
52	A S	E S		MIN 603	Minor 3	5	5	5			5/150	15	30.0			15	90				5.0			
53	A S	E S		VRT 6383	Pattern recognition systems	5	5	5			5/120	15	30.0			15	60				5.0			
54	A S	E S		VRT 6389	Visual information and data visualization	5					5/120	15	30.0			15	60							
55	A S	E S		SFT6 374	Architecture and Organization of Computer Systems	5	5	5			5/150	15	30.0			15	90				5.0			
56	A S	E S		SFT6 319	Blockchain technology	5	5	5			5/120	15	30.0			15	60				5.0			
57	A S	E S		SFT6 377	Development of computer games						5/120	15	30.0			15	60							
Weekly average workload at hours																									
1	General education subjects(GER)					56		12	0	0	16 80	90	60	54 0	0	15 0	840	0	10	17	9	20	0	0	0

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№	Module / Cycle	Credits	Courses	Academic period	Number of hours	S1	S2	S3	S4	S5	S6
1	Core subjects(GER/CS)	51	11	750	1530	10	17	9	15	0	0
	University component(GER/UC)	0	0	0	0	0	0	0	0	0	0
	Electives(GER/ES)	5	1	90	150	0	0	0	5	0	0
2	**Base requirements(BS)**	**84**	**16**	**1275**	**2520**	**24**	**19**	**14**	**12**	**0**	**15**
	Core subjects(BS/CS)	0	0	0	0	0	0	0	0	0	0
	University component(BS/UC)	84	16	1275	2520	24	19	14	12	0	15
	Electives(BS/ES)	0	0	0	0	0	0	0	0	0	0
3	**Profession requirements(VRS)**	**92**	**18**	**1560**	**2760**	**5**	**5**	**20**	**5**	**41**	**16**
	Core subjects(VRS/CS)	0	0	0	0	0	0	0	0	0	0
	University component(VRS/UC)	52	10	900	1560	5	5	10	0	16	16
	Electives(VRS/ES)	40	8	660	1200	0	0	10	5	25	0
4	**Disciplines for the formation of professional competencies(BDFPC)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Core subjects(BDFPC/CS)	0	0	0	0	0	0	0	0	0	0
	University component(BDFPC/UC)	0	0	0	0	0	0	0	0	0	0
	Electives(BDFPC/ES)	0	0	0	0	0	0	0	0	0	0
5	**Disciplines of personal development and the formation of leadership qualities(BDPD)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Core subjects(BDPD/CS)	0	0	0	0	0	0	0	0	0	0
	University component(BDPD/UC)	0	0	0	0	0	0	0	0	0	0
	Electives(BDPD/ES)	0	0	0	0	0	0	0	0	0	0
	Total on curriculum	**232**		**3675**	**6960**	**39**	**41**	**43**	**37**	**41**	**31**

№		Number of credits	Number of hours	Number of weeks
6	Additional courses			
7	Module of final certification (MoFC)	8	240.0	
	Total including FC	**240**	**7200.0**	

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7. Approval sheet with developers

Name of the educational program: 6B06118 "Immersive Technologies" (Immersive technologies)

№	Position, academic or academic degree and Surname of the Acting developer of the educational program	Date	Signature	Note
1	T.T. Chinibayeva PhD, Head of the Department of CE			
2	D.D.Yermekova, senior-lecturer			
3				
4				