ХАЛЫҚАРАЛЫҚ АҚПАРАТТЫҚ ТЕХНОЛОГИЯЛАР УНИВЕРСИТЕТІ
МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ
INTERNATIONAL UNIVERSITY

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"19" 03 2024

6B06118
Immersive technologies

CATALOGUE OF ELECTIVE DISCIPLINES

2024 entry year

2024

The catalogue of elective disciplines for the specialty/AP 6B06118 Immersive technologies is developed on the basis of the working curriculum of the specialty/AP.

The catalogue of elective disciplines was discussed at a meeting of the Computer Engineering department

minutes No. _____ from "____" _____2024

Head of Dep _____ T.T. Chinibayeva

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The catalogue of elective disciplines was approved at a meeting of the Academic Council of IITU JSC minutes No. _____ from "____" _____2024

Head of the management of educational and methodological activities _____ A.Ajibayeva

1 TERMS AND ABBREVIATIONS

1. 1 Academic program is a single set of basic characteristics of education, including goals, results and content of training, the organization of educational process, ways and methods for their implementation and criteria for assessing learning outcomes. The content of academic program of higher education consists of three cycles of disciplines - general education disciplines (hereinafter - GED), basic disciplines (hereinafter - BD) and core disciplines (hereinafter - CD). The cycle of GED includes disciplines of the compulsory component (hereinafter - CC), the university component (hereinafter - UC) and (or) the component of choice (hereinafter - COC). BD and CD include disciplines of UC and COC.

1. 2 Catalogue of elective disciplines (CED) is a systematic annotated list of all COC disciplines, for the entire training period, containing a brief description indicating the purpose of study, a summary of main sections and expected learning outcomes. CED reflects the prerequisites and postrequisites of each academic discipline. It should provide the students with the possibility of an alternative choice of elective disciplines for the formation of an individual educational trajectory.

On the basis of academic program and CED, the students develop individual curricula with the help of advisers.

1. 3 Individual curriculum (IC) is a curriculum formed by the students independently with the help of an adviser for each academic year on the basis of the academic program, the catalogue of elective disciplines or modules;

IC defines an individual educational trajectory of each student separately. It includes disciplines and types of educational activities (internship, experimental research, forms of final certification) of the compulsory component (CC), the university component (UC) and the component of choice (COC).

1. 4 Advisor is a teacher who performs the functions of an academic mentor of a student (according to the appropriate academic program), and assists in choosing a learning path (creating an individual curriculum) and mastering the academic program during the training period.

1. 5 The university component is a list of compulsory educational disciplines determined by the university independently for the mastering of the academic program.

1. 6 The component of choice is a list of academic disciplines and the corresponding minimum amounts of academic credits offered by the university and independently chosen by students in any academic period, taking into account their prerequisites and postrequisites.

1. 7 Elective disciplines are educational disciplines that are a part of the university component and the component of choice in the framework of established academic credits, introduced by organizations of education reflecting the individual preparation of students and taking into account the specifics of socio-economic development, the needs of a particular region and established scientific schools.

1. 8 Postrequisites are the disciplines and (or) modules and other types of academic work, the study of which requires knowledge, skills and competencies acquired at the end of the study of this discipline and (or) modules;

1. 9 Prerequisites are the disciplines and (or) modules and other types of educational work containing knowledge, abilities, skills and competencies necessary for the mastering of the studied discipline and (or) modules;

1. 10 Competencies are the ability of the practical use of acquired knowledge and skills in professional activities.

2 ELECTIVE DISCIPLINES

No.	Discipline code	Name of the discipline	Semester	Loans	Prerequisites
1.	MIN601	Minor1	3	5	None
2.	EGR6376	Computer and mathematical modeling	3	5	ICT, Mathematica analysis
3.	SFT6378	Introduction to Machine Learning	3	5	Algebra and geometry, Theory of Probability and Mathematical Statistics
4.	MIN602	Minor 2	4	5	Minor 1
5.	RM6502	Research metodology	4	5	Culturology-Psychology
6.	ECO6006	Economic theory	4	5	no
7.	FIN6720	Basics of Financial Literacy	4	5	no
8.	JUR 6470	Fundamentals of law and anti-corruption culture	4	5	Culturology-Psychology
9.	MGT6706	Startups and entrepreneurship	4	5	no
10.	JUR 6507	Fundamentals safety of life activity and ecology	4	5	Sociology-Political Science
11.	SFT6319	Blockchain technology	5	5	Introduction to Programming, Algorithmization and Programming
12.	SFT6377	Development of computer games	5	5	Mathematical analysis
13.	MIN603	Minor 3	5	5	Minor 2
14.	VRT6383	Pattern recognition systems	5	5	Algebra and geometry, Mathematical analysis, Introduction to programming
15.	VRT6389	Visual information and data visualization	5	5	Mathematical analysis Linear algebra and geometry Theory of Probability and Mathematical Statistics
16.	SFT6374	Architecture and organization of computer systems	5	5	ICT

17.	VRT6386	Technologies for the development of digital twins + BIM	5	5	Fundamentals of computer science Theory of Probability and Mathematical Statistics Basics of mathematical analysis
18.	SFT6376	Microsoft .NET Framework - Application Development	5	5	OS Database

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Description of the discipline	
Discipline code	MIN601
Name of the discipline	Minor 1
Number of credits (ESTS)	5
Course, semester	2.1
Department name	Computer engineering
Prerequisites	none
Postrequisites	Minor 2
The purpose of studying the discipline	Additional formation of competencies
Brief description of the course (main sections)	An additional educational program (Mipog) is a set of disciplines and (or) modules and other types of educational work determined by the student for study in order to form additional competencies
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	Students acquire the following knowledge, skills, and abilities

Description of the discipline	
Discipline code	EGR6376
Name of the discipline	Computer and mathematical modeling
Number of credits (ESTS)	5
Course, semester	2, 1
Department name	Computer engineering
Prerequisites	ICT Mathematical analysis
Postrequisites	
The purpose of studying the discipline	The purpose of studying the discipline "Computer and Mathematical Modeling" is to provide students with knowledge and skills in the field of creating and using computer and

	mathematical models of various systems, processes and phenomena. Within this discipline, students study the methods and tools of mathematical and computer modeling, which allow you to create abstract models of real objects, systems or processes, as well as analyze their properties and behavior. In addition, the purpose of studying the discipline is also the formation of students' skills in solving practical problems using modern tools and computer modeling technologies, as well as developing their critical thinking and the ability to analyze and evaluate the results obtained. In general, the study of the discipline "Computer and mathematical modeling" is an important component of education in the field of applied mathematics, computer science, physics, economics, biology, mechanics and many other sciences that use modeling to study and optimize complex systems and processes.
Brief description of the course (main sections)	The discipline "Computer Mathematical Modeling" opens up wide opportunities for understanding the connection between computer science and mathematics and other sciences - natural and social. Computer mathematical modeling in its various manifestations uses almost the entire apparatus of modern mathematics. The discipline contains the study of the basic principles of mathematical modeling and programming for technical calculations. Very often, mathematical modeling methods are the only possible ones.
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	After studying the discipline "Computer and Mathematical Modeling", students acquire the following knowledge, skills, abilities and competencies: Knowledge: Fundamentals of mathematical modeling; Fundamentals of computer modeling; Methods and tools for creating and analyzing mathematical and computer models; Fundamentals of numerical methods and algorithms; Understanding the principles of operation of modeling complex systems. Skills: Design and development of mathematical and computer models; Selection and use of appropriate methods and tools for modeling various systems and processes; Analysis of simulation results and their interpretation; Optimization and improvement of models. Skills:

	Development and programming of computer models; Work with various software and modeling tools; Working with large amounts of data; Conducting scientific research and analysis of results. Competencies: Ability to create mathematical and computer models; Communication skills to present simulation results; Critical thinking and the ability to analyze and evaluate simulation results; Ability to apply knowledge and modeling skills in various fields of science and technology. In general, the study of the discipline "Computer and Mathematical Modeling" provides students with the necessary knowledge, skills and competencies to work with mathematical and computer models of various systems and processes, as well as to solve various problems in scientific and engineering fields.

Description of the discipline	
Discipline code	SFT6378
Name of the discipline	Introduction to Machine Learning
Number of credits (ESTS)	5
Course, semester	2.1
Department name	Computer engineering
Prerequisites	Algebra and geometry, Theory of Probability and Mathematical Statistics
Postrequisites	computer vision
The purpose of studying the discipline	The purpose of studying the discipline "Introduction to Machine Learning" is to familiarize students with the basics of the theory and practice of machine learning - one of the key areas of artificial intelligence.
Brief description of the course (main sections)	Implement basic ML algorithms (decision tree, KNN, KMC, perceptron) in Python and Matlab for various problems of pattern recognition in information
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	The expected results of studying the discipline include: Knowledge: Understanding the basic concepts and terms used in machine learning; Knowledge of the main approaches to solving machine learning problems; Knowledge of basic teaching methods with and without a teacher. Skills:

	Ability to determine the type of machine learning problem and choose the appropriate solution method; Ability to process and preprocess data for training machine learning models; Ability to implement and tune machine learning models. Skills: Working knowledge of various machine learning tools and libraries; Data processing and analysis skills; Skills in applying machine learning algorithms to solve problems. Competencies: The ability to make independent decisions when choosing approaches and methods of machine learning for solving problems; Ability to analyze and interpret learning outcomes of machine learning models; The ability to build high-quality machine learning models for solving various problems. As a result of studying the discipline, students should be able to implement machine learning models, tune their parameters, analyze learning outcomes, and choose appropriate methods and approaches to solve machine learning problems.

Description of the discipline	
Discipline code	MIN602
Name of the discipline	Minor 2
Number of credits (ESTS)	5
Course, semester	2.2
Department name	Computer engineering
Prerequisites	Minor 1
Postrequisites	Minor 3
The purpose of studying the discipline	Additional formation of competencies
Brief description of the course (main sections)	An additional educational program (Mipog) is a set of disciplines and (or) modules and other types of educational work determined by the student for study in order to form additional competencies
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	Students acquire the following knowledge, skills, and abilities

Description of discipline	
Code of discipline	RM6502
Name of discipline	Research methodology
Number of credits (ECTS)	5
Course, semester	2.2
Department	CE
Prerequisites	Culturology-Psychology
Postrequisites	no
Brief course description	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).

Description of discipline	
Code of discipline	ECO6006
Name of discipline	Economic theory
Number of credits (ECTS)	5
Course, semester	2.2
Department	CE
Prerequisites	
Postrequisites	Culturology-Psychology
Brief course description	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

Description of discipline	
Code of discipline	JUR 6470
Name of discipline	Fundamentals of law and anti-corruption culture
Number of credits (ECTS)	5
Course, semester	2.2
Department	CE
Prerequisites	Sociology-Political Science
Postrequisites	
Brief course description	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.

Description of discipline	
Code of discipline	MGT6706
Name of discipline	Startups and entrepreneurship
Number of credits (ECTS)	5
Course, semester	2.2
Department	CE
Prerequisites	Sociology-Political Science
Postrequisites	
Brief course description	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.

Description of discipline	
Code of discipline	JUR 6507
Name of discipline	Fundamentals safety of life activity and ecology
Number of credits (ECTS)	5
Course, semester	2.2
Department	CE
Prerequisites	
Postrequisites	
Brief course description	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.

Description of discipline	
Code of discipline	FIN6720
Name of discipline	Basics of Financial Literacy
Number of credits (ECTS)	5
Course, semester	2.2

Department	CE
Prerequisites	
Postrequisites	
Brief course description	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.

Description of the discipline	
Discipline code	SFT6319
Name of the discipline	Blockchain technology
Number of credits (ESTS)	5
Course, semester	3.1
Department name	Computer engineering
Prerequisites	Introduction to Programming, Algorithmization and Programming
Postrequisites	Diploma project
The purpose of studying the discipline	The discipline is devoted to the study and application of blockchain technology, which is a decentralized and secure way of recording and transmitting data. Within the framework of this discipline, students will learn the principles of the blockchain, its application in finance, logistics and other industries.
Brief description of the course (main sections)	The Blockchain course is designed for those who want to learn more about blockchain technology and its application. The course will cover how blockchain works, what advantages and disadvantages it has, which cryptocurrencies and tokens use blockchain, how to create and use smart contracts, as well as what examples of blockchain applications exist in various fields such as finance, logistics, medicine, etc.
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	Blockchain applications in various fields such as finance, logistics, medicine, etc.

Description of the discipline	
Discipline code	SFT6377

Name of the discipline	Development of computer games
Number of credits (ESTS)	5
Course, semester	3.1
Department name	Computer engineering
Prerequisites	ICT
Postrequisites	Development of VR systems , computer graphics
The purpose of studying the discipline	The purpose of studying the discipline "Development of computer games" is to familiarize students with the basics of design, development and design of computer games.
Brief description of the course (main sections)	This course focuses on the design, development and testing of entertainment and information applications. Acquaintance with the principles of developing games oriented to different circles of consumers. Disclosure of the specifics of development for various platforms: desktop, mobile, tablet devices, game consoles, as well as embedded web applications.
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	The expected results of studying the discipline include: Knowledge: Understanding the basic principles of computer game development; Knowledge of software tools and programming languages used to create games; Understanding the principles of game mechanics, balance and passing the game; Knowledge of the main technologies and patterns used in the development of computer games; Knowledge of the main aspects of visual and sound design of games. Skills: Ability to design and create computer games; Ability to use software tools and programming languages for game development; Ability to create game mechanics, balance and game progression; Ability to apply technologies and patterns for game development; Ability to produce visual and sound design of games. Skills: Skills in working with various software tools and programming languages for creating games; Skills in designing game mechanics, balance and passing the game; Skills in creating visual and sound design of games. Competencies: Ability to independently develop games;

	Ability to analyze and evaluate the quality and success of the game; Ability to work in a team in game development. As a result of studying the discipline, students should be able to develop computer games, use various software tools and programming languages, create game mechanics, balance and playthrough, as well as produce visual and sound design of games. They must also be able to work in a team and analyze the quality and success of the game.

Description of the discipline	
Discipline code	MIN603
Name of the discipline	Minor 3
Number of credits (ESTS)	5
Course, semester	3.1
Department name	Computer engineering
Prerequisites	Minor 2
Postrequisites	Research methodology
The purpose of studying the discipline	Additional formation of competencies
Brief description of the course (main sections)	An additional educational program (Mipog) is a set of disciplines and (or) modules and other types of educational work determined by the student for study in order to form additional competencies
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	Students acquire the following knowledge, skills, and abilities

Description of the discipline	
Discipline code	VRT6383
Name of the discipline	Pattern recognition systems
Number of credits (ESTS)	4
Course, semester	3.1
Department name	Computer engineering
Prerequisites	Algebra and geometry, Mathematical analysis, Introduction to programming
Postrequisites	computer vision
The purpose of studying the discipline	The purpose of studying the discipline "Pattern Recognition Systems" is to introduce students to the basic methods and algorithms of pattern recognition that are used in computer

	vision and other areas where automatic pattern recognition is required.
Brief description of the course (main sections)	This discipline is aimed at mastering by students the basics and methods of classifying and identifying objects, phenomena, processes, signals, situations and other objects characterized by a finite set of certain properties and features.
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	Expected results of studying the discipline: Understanding the basic principles and methods of pattern recognition, including mathematical methods and statistical algorithms. Ability to develop pattern recognition algorithms using various approaches and methods such as pattern recognition, neural networks and machine learning. Skills in working with software tools and libraries used to implement pattern recognition systems, such as OpenCV and TensorFlow. Ability to apply pattern recognition systems in practical tasks, for example, to recognize handwritten numbers or faces. Understanding the application of image recognition systems in various fields, including computer vision, robotics, medicine, automotive industry, etc.

Description of the discipline	
Discipline code	VRT6389
Name of the discipline	Visual information and data visualization
Number of credits (ESTS)	4
Course, semester	3.1
Department name	Computer engineering
Prerequisites	Mathematical analysis Linear algebra and geometry Theory of Probability and Mathematical Statistics
Postrequisites	Machine learning, computer graphics
The purpose of studying the discipline	The purpose of studying the discipline "Visual Information and Data Visualization" is to familiarize students with the basic concepts and methods of visualizing information and data, as well as to develop their skills in working with visualization tools.
Brief description of the course (main sections)	This discipline studies the basics and history of visualization, data density, visualization quality indicators, the main levels of visualization, the classification of visualization methods, data presentation methods: tabular and graphic, the market for quantitative data visualization tools, as well as the rules for constructing visual presentations, especially the perception of visual information

Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	The expected results of studying this discipline include: Understanding the basic principles of information and data visualization. Ability to analyze data and determine the most effective way to visualize it. Knowledge of the main types of graphs and charts and the ability to choose the most appropriate type for representing different types of data. Ability to work with data visualization software tools such as Tableau , Power BI, Excel, etc. Skills in creating information dashboards and reports using data visualization tools. Ability to work with various types of data, including numerical, categorical, textual, geographic and temporal data. Knowledge of the basic principles of visualization design and the ability to create understandable and effective data visualizations. Understanding the principles of big data visualization and the ability to work with large amounts of data. Ability to analyze and interpret data visualizations. As a result of studying this discipline, students will receive the necessary knowledge and skills to work with data and visualize it, which is an important component of modern data analytics and business intelligence. They will be able to successfully apply their knowledge in practice to create effective and understandable data visualizations.

Description of the discipline	
Discipline code	SFT6374
Name of the discipline	Architecture and organization of computer systems
Number of credits (ESTS)	5
Course, semester	3.1
Department name	Computer engineering
Prerequisites	ICT
Postrequisites	
The purpose of studying the discipline	Know the main components of a computer, including the CPU, ALU and control unit, memory, I/O and memory, and a wide range of memory technologies, both internal and external.
Brief description of the course (main sections)	Computer architecture is studied with an emphasis on a quantitative approach to the trade-off between cost and performance.

Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	The expected results of studying this discipline include: Knowledge of the basic principles of computer systems, including hardware and software components. Understanding the principles of building computing systems, including multiprocessor and distributed systems. Ability to design, evaluate and optimize hardware and software for computer systems. Skills in working with assembly language, compilers, operating systems and other software development and debugging tools. Ability to analyze and solve problems related to the architecture and organization of computer systems. Studying the discipline "Architecture and organization of computer systems" allows students to gain in-depth knowledge and practical skills for working with computer systems and software development. It also gives them the ability to understand how computer hardware and software works and how it can be optimized to improve performance and efficiency.

Description of the discipline	
Discipline code	VRT6386
Name of the discipline	Technologies for the development of digital twins + BIM
Number of credits (ESTS)	5
Course, semester	3.1
Department name	Computer engineering
Prerequisites	Fundamentals of computer science Theory of Probability and Mathematical Statistics Basics of mathematical analysis
Postrequisites	
The purpose of studying the discipline	The purpose of studying the discipline "Technologies for the development of digital twins + BIM" is to acquaint students with modern technologies for the development and use of digital twins and BIM models in engineering design and construction
Brief description of the course (main sections)	This discipline is aimed at familiarization with the technologies for developing digital twins. This is a special type of simulation models that represent real objects. This is achieved by combining the subject's data with its simulation model. During the course of the study, the characteristics and device will be considered, the problems of creating a good digital twin using the AutoDesk solution package .

Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	The expected results of studying this discipline include: Understanding the basic principles and concepts of developing and using digital twins and BIM models. Knowledge of basic methods and tools for creating and managing digital twins and BIM models. Ability to create, analyze and visualize digital twins and BIM models. Skills in using digital twins and BIM models to optimize engineering design and construction processes. Understanding the role of digital twins and BIM models in the life cycle of buildings and structures. Ability to work in a team and use digital twins and BIM models to improve the efficiency of the project team.

Description of the discipline	
Discipline code	SFT6376
Name of the discipline	Microsoft .NET Framework - Application Development
Number of credits (ESTS)	5
Course, semester	3.1
Department name	Computer engineering
Prerequisites	OS Database
Postrequisites	developing applications on the .NET platform
The purpose of studying the discipline	The purpose of studying the discipline "Microsoft .NET Framework - Application Development" is to familiarize students with the tools and technologies used to develop applications on the .NET Framework platform.
Brief description of the course (main sections)	An overview of .NET technology that supports data and media transfer. Applying the concept to practical tasks related to the development of distributed applications (web servers, calendars and chat systems). Study of application protocols and approaches to distributed object-oriented programming using C#.
Expected results of the study (acquired by students knowledge, skills, abilities and competencies)	The expected results of studying this discipline include: Knowledge of the basic concepts and architecture of the .NET Framework. Understanding the principles of object-oriented programming and the ability to apply them in the context of the .NET Framework. Ability to develop applications in the C# programming language using the .NET Framework. Ability to use the Visual Studio IDE to build, debug, and test applications on the .NET Framework.

	Experience with the various data types and collections available in the .NET Framework. Understanding the principles of working with databases and the ability to create applications using ADO.NET technology. Ability to develop applications that use multithreading and asynchrony to increase performance and responsiveness. Knowledge of basic design patterns and the ability to apply them in the context of the .NET Framework. Skills in creating web applications using ASP.NET and working with web services. Ability to develop cross-platform applications using .NET Core. As a result of studying this discipline, students will receive the necessary knowledge and skills to develop modern applications on the .NET Framework platform and will be able to successfully apply them in practice.