ХАЛЫҚАРАЛЫҚ УНИВЕРСИТЕТІ
МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ
INTERNATIONAL UNIVERSITY

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Immersive technologies

CATALOGUE OF ELECTIVE DISCIPLINES

2023 entry year

2023

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.

10.	PD	SFT6374	Architecture and organization of computer systems	8	5	ICT

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Description of the discipline	
Discipline code	EGR6376
Name of the discipline	Computer and mathematical modeling
Number of credits (ESTS)	5
Course, semester	3, 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.

	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

	As a result of studying the discipline, students should be able to process and analyze digital images, select and configure appropriate digital image processing methods and algorithms for solving problems, and analyze and interpret the results of image processing.

Description of the discipline	
Discipline code	SFT6377
Name of the discipline	Development of computer games
Number of credits (ESTS)	5
Course, semester	3.2
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:

	tools (engines) for managing the model interactively in real time. The experience and products of leading companies in the development of software and hardware for virtual reality systems are presented.
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 principles of operation of virtual reality systems; Knowledge of technologies used in virtual reality; Understanding the principles of user interaction with virtual reality systems; Knowledge of the main aspects of the development and creation of virtual worlds. Skills: Ability to design and create virtual worlds; Ability to use software tools and technologies to work with virtual reality systems; Ability to create user interaction with virtual worlds; Ability to produce visual and sound design of virtual worlds. Skills: Skills in working with various software tools and technologies for working with virtual reality systems; Virtual world design skills; Skills in creating user interaction with virtual worlds; Skills in the production of visual and sound design of virtual worlds. Competencies: Ability to independently develop virtual worlds; Ability to analyze and evaluate the quality of virtual worlds; Ability to work in a team when creating virtual worlds. As a result of studying the discipline, students should be able to design and create virtual worlds, use various software tools and technologies to work with virtual reality systems, create user interaction with virtual worlds, and produce visual and sound design of virtual worlds. They should also be able to work in a team and analyze the quality of virtual worlds.

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	4.1
Department name	Computer engineering

	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.

Description of the discipline	
Discipline code	VRT6389
Name of the discipline	Visual information and data visualization
Number of credits (ESTS)	4
Course, semester	4.1
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.

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	SFT6374
Name of the discipline	Architecture and organization of computer systems
Number of credits (ESTS)	5
Course, semester	4.2
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.