ХАЛЫҚАРАЛЫҚ
УНИВЕРСИТЕТІ
INTERNATIONAL UNIVERSITY
МЕЖДУНАРОДНЫЙ
УНИВЕРСИТЕТ

Faculty of «Computer technology and cybersecurity»
Department of «Mathematical and computer modeling»

6B06101

Computer Science

CATALOGUE OF ELECTIVE DISCIPLINES

2024-2028 year of admission

2024 y.

The catalogue of elective disciplines for the EP pf the MCM department is developed on the basis of the working curriculum of the EP "6B06101 Computer Science".

The catalogue of elective disciplines was discussed at a meeting of the department of Mathematical and computer modeling

minutes No. _9_ from «_14_» _03_ 2024 y.

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1 TERMS AND ABBREVIATIONS

1. 1   Educational 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 educational 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 educational 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 advisor for each academic year on the basis of the educational 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 educational program) and assists in choosing a learning path (creating an individual curriculum) and mastering the educational 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 educational 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

№	Cycle of discipline	Name of discipline	Semester	Number of credits	Prerequisites
			3 year		
2	CD COC	Economic theory	5	5	
		Startups and entrepreneurship	5	5	
		Fundamentals safety of life activity and ecology	5	5	
		Fundamentals of law and anti-corruption culture	5	5	
		Research methodology	5	5	
		Basics of Financial Literacy	5	5	
			4 year		
3	CD COC	Amazon Web ServicesFoundations (AWS Foundations)	8	5	Information and Communication Technologies
		Parallel computation	8	5	Architecture and Organization of Computer Systems, Java Programming
		Human-Computer Interaction	8	5	Information and Communication Technologies, Introduction to Programming
4	CD COC	Development of mobile applications on Android	8	6	
		Development of mobile applications on IOS	8	6	

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Description of discipline	
Name of the discipline	Economic Theory
The aim of study of a discipline	To reveal the origin and main stages of the development of economic theory as a science; the subject of economic theory; methods of understanding economic processes and their classification; economic categories, laws, and principles; functions of economic theory; the role of economic theory as the theoretical and methodological foundation for other economic disciplines.
Brief course description (main sections)	The course provides an overview of the principles and patterns of economic relations. This course aims to assist students in studying the precise categorical-conceptual framework of the economic system of society, based on a new technology for organizing the positive process, at a time when the market transformation of the economy has only begun, and the theoretical understanding of what is happening is not yet complete.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Students will gain sufficient knowledge of the economic framework, the ability to understand the theoretical positions of various economic schools, the essence, and the mechanism of the functioning of economic laws.

Description of discipline	
Name of the discipline	Startups and Entrepreneurship
The aim of study of a discipline	To provide students with systematic and practical knowledge about the process of realizing a technological product from idea to market launch.
Brief course description (main sections)	The course is designed to help students develop IT competencies, entrepreneurial skills, teamwork, business skills, and soft skills.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- Ability to create startup teams and independently exist in the market. - Proficiency in entrepreneurial thinking tools. - Skills in interacting with business mentors. - Skills in determining the optimal model for monetizing their project. - Project management skills. - Knowledge of how technological startups are created and understanding how to apply this knowledge to their own projects - Ability to identify the target audience for their project.

Description of discipline	
Name of the discipline	Fundamentals of law and anti-corruption culture
The aim of study of a discipline	The goal of the course is to establish the foundations of an anti-corruption culture, forming the ability to describe the essence and causes of corruption in society.
Brief course description (main sections)	Within the framework of the course, students will become familiar with concepts such as anti-corruption awareness and anti-corruption culture, gain knowledge about corruption as a phenomenon of modern reality and its historical roots. The course develops skills for working with legislation in the field of combating corruption and fosters a civic stance towards this issue. This course is aimed at improving anti-corruption culture and forming a morally ethical foundation in society.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Acquires knowledge, skills, and abilities in combating corruption.

Description of discipline	
Name of the discipline	Fundamentals of ecology and life safety
The aim of study of a discipline	To provide students with the volume of theoretical knowledge and practical skills necessary to solve the following tasks: - Creating normal conditions in areas of human labor and recreation; - Developing and implementing measures to protect humans and their environment from harmful effects;

	• Designing new technology and technological processes in accordance with modern safety requirements for their operation; • Ensuring the stability of economic facilities and technical systems in normal conditions and emergencies; • Forecasting and assessing the consequences of emergencies; • Making decisions to protect the population, production personnel, and property from the consequences of accidents, disasters, natural and man-made hazards, and applying protective measures in case of emergencies, as well as taking measures for response and liquidation.
Brief course description (main sections)	This higher education course studies methods of safe interaction between humans and their environment (industrial, domestic, urban, natural), sustainable operation of economic facilities (organizations) under emergency conditions, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies, and the application of modern protective measures.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• Ability to create normal conditions in areas of human labor and recreation. • Development and implementation of measures to protect humans and their environment from harmful impacts. • Designing new technology and technological processes in accordance with modern safety requirements for their operation. • Ability to forecast and assess the consequences of emergencies. • ☐ Making decisions to protect the population, industrial personnel, and property from the consequences of accidents, disasters, natural hazards, and the use of modern protective measures, as well as taking actions for their mitigation.

Description of discipline	
Name of the discipline	Research Methodology
Postrequisites	Writing and defense of a diploma project
The aim of study of a discipline	The course develops an understanding of the evidence-based approach in education. It introduces students to the concept of an information base for decision-making, evaluation of effectiveness of changes, programs, and policies. The course develops knowledge and skills for conducting and interpreting research results using various research designs, as well as qualitative and quantitative data collection methods.
Brief course description (main sections)	The course focuses on activities aimed at developing students' ability to independently formulate theoretical and practical judgments and conclusions, skills in objectively evaluating scientific information, independence in scientific research, and the aspiration to apply scientific knowledge in educational activities, including for the completion of a diploma project (work).

Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• Able to write a research paper using LaTeX. • Designs research instruments in accordance with research questions and goals. • Able to determine the optimal way to access respondents/informants. • Proficient in techniques of participant observation. • Demonstrates knowledge of research ethics at all stages of conducting qualitative research. • Able to conduct initial data analysis. • Identifies advantages and limitations of different survey data collection methods. • Justifies the relevance of the research question based on practical tasks and real situation analysis, with support from scientific literature.

Description of discipline	
Name of the discipline	Basics of Financial Literacy
The aim of study of a discipline	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.
Brief course description (main sections)	The "Basics of Financial Literacy" course covers personal finance management, including budgeting, saving, investing, and tax responsibilities. Main sections include budgeting and expenses, savings and investments, financial tools, tax basics, and financial analysis.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Upon completion, students will gain: 1. **Knowledge**: Understanding personal finance, financial products, and investment strategies. 2. **Abilities**: Skills in budgeting, selecting financial tools, and calculating taxes. 3. **Skills**: Practical skills in budgeting, saving, using financial tools, and tax filing. 4. **Competencies**: Confidence in financial decision-making, product selection, and strategy adaptation for financial goals.

Description of discipline	
Name of the discipline	Amazon Web Services Foundations (AWS Foundations)
Pretrequisites	ICT (Information and Communication Technology)
The aim of study of a discipline	The course is designed for students who aim to gain a general understanding of cloud computing concepts, regardless of specific technical roles. It provides a detailed overview of cloud concepts, core AWS services, security, architecture, pricing, and support. The course is recommended not only for students in technical specialties but also for students specializing in business and management. After completing this course, students will be encouraged to take the "AWS Certified Cloud Practitioner" exam, and upon passing, they will receive an internationally recognized AWS certification (link: https://aws.amazon.com/certification/certified-cloud-practitioner/). Since MUIT is an Amazon partner for the AWS Academy program, students will receive a 50% discount on their first exam attempt and free access to the paid practice exam.
Brief course description (main sections)	The main topics/sections covered in the course are as follows: 1. Cloud Concepts Overview 2. Cloud Economics and Billing 3. Overview of AWS Global Infrastructure 4. Cloud Security 5. Networking and Content Delivery 6. Computing 7. Storage

	8. Databases
	9. Cloud Architecture
	10. Automatic Scaling and Monitoring

Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Upon completing this course, students will be able to: • Define AWS cloud. • Explain the AWS pricing philosophy. • Identify components of AWS global infrastructure. • Describe security and compliance measures in AWS, including AWS Identity and Access Management (IAM). • Create a virtual private cloud (VPC) using Amazon Virtual Private Cloud (Amazon VPC). • Demonstrate when to use Amazon Elastic Compute Cloud (Amazon EC2), AWS Lambda, and AWS Elastic Beanstalk. • Explain the differences between Amazon Simple Storage Service (Amazon S3), Amazon Elastic Block Store (Amazon EBS), Amazon Elastic File System (Amazon EFS), and Amazon Simple Storage Service Glacier (Amazon S3 Glacier). • Demonstrate when to use AWS database services, including Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon Redshift, and Amazon Aurora. • Explain AWS architectural principles. • Study and understand key concepts related to elastic load balancing: Amazon CloudWatch and Amazon EC2 Auto Scaling. **Additional Bonus/Outcome**: You will receive a 50% discount for the official "AWS Certified Cloud Practitioner" exam.

Description of discipline	
Name of the discipline	Parallel Computation
Pretrequisites	Architecture and Organization of Computer Systems, Java Programming
The aim of study of a discipline	The objective of the course is to develop students' theoretical knowledge and skills in developing, researching performance, optimizing, and debugging parallel programs for modern processor architectures and graphics accelerators.
Brief course description (main sections)	The "Parallel Programming" course is dedicated to studying the theory and methods of practical development of parallel programs for modern computer architectures. A distinctive feature of the course is the comprehensive consideration of parallelism issues at both the library level, accessible to application programmers, and at a level close to the architecture of microprocessors and graphics accelerators, which is more critical for system programmers.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• Know the basic principles of CUDA. • Know the basic principles of OpenACC and OpenMP. • Know the basic principles of OpenMP. • Know the basic principles of CPU performance analysis. • Know the basic principles of vector parallelism. • Know the basic principles of memory access optimization. • Have an understanding of approaches to ensuring parallelism.

Description of discipline	
Name of the discipline	Human-Computer Interaction
Prerequisites	Information and Communication Technologies, Introduction to Programming
The aim of study of a discipline	To understand the natural language of the computer; the computer's ability to recognize the speech of any user; heuristic programming, i.e., "intellectualization" of program operations by making it more flexible and heuristic in its "thinking."
Brief course description (main sections)	This course deals with the design, evaluation, and implementation of interactive computing systems for human use, as well as studying the main phenomena related to these issues. It is often considered an interdisciplinary field encompassing computer science, behavioral science, design, and other research areas. Interaction between users and computers occurs at the user interface level (or simply the interface), which includes both software and hardware components, such as images or objects displayed on screens, data from input devices (such as keyboards and mice), and other interactions with automated systems, like aircraft and ship navigation systems and electronics.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• Focus attention on the needs of users and tasks. • Conduct interface testing with real users. • Be able to design user interfaces. • Analyze results.

Description of discipline	
Name of the discipline	Development of mobile applications on Android
Prerequisites	
The aim of study of a discipline	To acquire in-depth knowledge in the field of mobile application development for the Android operating system.
Brief course description (main sections)	The course includes the following sections: • Connecting and using third-party libraries • Data storage • Frameworks • Data exchange formats • Data mapping • Client-server interaction • Dynamic behavior of interface objects • Application testing coverage • Application security

Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	The student should be able to: • Independently design application architecture for the Android OS. • Independently develop mobile applications implementing client-server interaction functionality. • Independently connect and adapt third-party libraries.

Description of discipline	
Name of the discipline	Development of mobile applications on IOS
Prerequisites	
The aim of study of a discipline	To acquire in-depth knowledge in the field of mobile application development for the iOS operating system.
Brief course description (main sections)	The course includes the following sections: • Connecting and using third-party libraries • Data storage • Frameworks • Data exchange formats • Data mapping • Client-server interaction • Dynamic behavior of interface objects • Application testing coverage • Application security
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	The student should be able to: • Independently design application architecture for the iOS OS. • Independently develop mobile applications implementing client-server interaction functionality. • Independently connect and adapt third-party libraries.