Faculty of Computer Technologies and Cybersecurity
Department of "Mathematical and Computer Modeling"

APPROVED
Vice-rector for academic and educational affairs of
JSC "International University of Information Technologies"
_____ Umarov T.F.
(Signature) (FULL NAME.)
"30" 03 2021

_____ 6B06114 _____
(Code of the Educational program)

_____ Biocomputing _____
(Name of the Educational Program)

CATALOG OF ELECTIVE DISCIPLINES

2021 year of receipt

2021 y.

The catalog of elective disciplines for EP 6B06114 Biocomputing was developed on the basis of the EP working curriculum.

The catalog of elective disciplines was discussed at a meeting of the Department of Mathematical and Computer Modeling

Minutes No. 8 dated March 05, 2021

Head of the Department _____ Ydyrys A.Zh.
signature Name, title, degree

Compiled by CED _____ Satybaldina A.N.
signature Name, title, degree

The catalog of elective disciplines was approved at a meeting of the Educational and Methodological Council of JSC "International University of Information Technologies"

Minutes No. 4 dated March 30, 2021.

Director of DAA _____ Mustafina A.K.
signature Name, title, degree

1 TERMS AND ABBREVIATIONS

1. 1 An educational program is a single complex of the main characteristics of education, including goals, results and content of education, organization of the educational process, methods and methods of their implementation, criteria for assessing learning outcomes.

The content of the educational program of higher education consists of disciplines of three cycles - general education disciplines (hereinafter referred to as OOD), basic disciplines (hereinafter referred to as DB) and major disciplines (hereinafter referred to as PD).

The OOD cycle includes the disciplines of a compulsory component (hereinafter referred to as OK), a university component (hereinafter referred to as VC) and (or) an optional component (hereinafter referred to as CV). DB and PD include the disciplines of VK and KV.

1. 2 The catalog of elective disciplines (CED) is a systematized annotated list of all disciplines of the elective component for the entire period of study, containing a brief description of them indicating the purpose of the study, a summary (main sections) and expected learning outcomes. The CED reflects the prerequisites and postrequisites of each academic discipline. CED should provide educators with the opportunity to choose an alternative choice of elective academic disciplines for the formation of an individual educational trajectory.

Based on the educational program and CED, students, with the help of advisors, develop individual curricula.

1. 3 Individual curriculum (IEP) - a curriculum formed for each academic year by students independently with the help of an adviser based on the educational program and the catalog of elective disciplines and (or) modules;

IEP determines the individual educational trajectory of each student separately. The IEP includes disciplines and types of educational activities (practices, research / experimental research work, forms of final certification) of a mandatory component (OK), a university component (VC) and an optional component (CV).

1. 4 An adviser is a teacher who performs the functions of an academic mentor studying according to an appropriate educational program, assisting in the choice of a learning path (formation of an individual curriculum) and mastering the educational program during the training period.

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

1. 6 Optional component - a list of academic disciplines and the corresponding minimum amount of academic credits offered by the university, independently selected by students in any academic period, taking into account their prerequisites and post-requisites.

1. 7 Elective disciplines are academic disciplines included in the university component and an optional component within the framework of established academic credits and introduced by educational organizations, reflecting the individual training of the student, taking into account the specifics of socio-economic development and the needs of a particular region, established scientific schools.

1. 8 Postrequisite (postrequisite) - disciplines and (or) modules and other types of educational work, the study of which requires knowledge, abilities, skills and competencies acquired upon completion of the study of this discipline and (or) modules;

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

1. 10 Competencies - the ability to practically use the knowledge, skills and abilities acquired in the learning process in professional activities.

2 ELECTIVE DISCIPLINES

No.	Cycle of discipline	Discipline Code	Name of the discipline	Semester	Number of credits	Prerequisites
			2 course			
one	PD KV	CED6501	Elective №1 from CED	4	6	
		SFT6511	Programming in Java 1			
		SFT6521	Programming in C # 1			
			3 course			
2	PD KV	CED6502	Elective №2 from CED	5	6	Elective №1 from CED
		SFT6512	Programming in Java 2			Programming in Java 1
		SFT6522	Programming in C # 2			Programming in C # 1
			4 course			
five	PD KV	CED6506	Elective №6 from CED	8	5	
		BIO6516	Laplace transformation in biological problems			General Biology, Mathematical Analysis
		EGR6536	Simulation of ill-posed problems			Numerical Methods, Algorithms and Data Structures, Introduction to Programming

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Discipline description	
Discipline Code	SFT6511
Name of the discipline	Programming in Java 1
Number of credits (ESTS)	6
Course, semester	2, 4
Department name	MCM
Course author (s)	Olzhaev O.M.
Prerequisites	-
Post-requisites	Java 2 Programming
The purpose of studying the discipline	The course will introduce students to object-oriented programming using Java. Students are expected to know the basics of scalar types (integers, strings, booleans) and fundamental control structures in procedural programming (loops, assignment statements, conditional expressions). Finally, it will include a short introduction to the Java Framework and Java JDBC.
Brief description of the course (main sections)	This course was designed to introduce the student to the Java language. Java GUI, Java Database will be studied in this course. Java's unique architecture allows programmers to develop a single application that can run smoothly and reliably across multiple platforms. In this hands-on course, students gain extensive experience with Java and its object-oriented features. Students learn to create robust console and graphical applications, and store and retrieve data from relational databases.
Expected results of the study (acquired by students knowledge, skills and competence)	□ Build robust console and graphical applications □ Understand the concept of OOP, as well as the purpose and principles of use inheritance, polymorphism, encapsulation and method overloading. □ Determine the classes, objects, members of the class and the relationships between them necessary for a specific problem. □ Build Java applications using robust OOP techniques (such as interfaces and APIs) and properly structuring the program (such as using access control identifiers, automatic documentation via comments, handling error exceptions).

Discipline description	
Discipline Code	SFT6521
Name of the discipline	Programming in C# 1
Number of credits (ESTS)	6
Course, semester	2, 4
Department name	MCM
Course author (s)	Zhanabekov Zh.
Prerequisites	-
Post-requisites	C # programming 2
The purpose of studying the discipline	Create a knowledge system about the .NET Framework class library and the object-oriented C # .NET language. Generate knowledge and skills for developing applications using C # .NET. Develop understanding and taking advantage of the .NET platform.
Brief description of the course (main sections)	The course is designed to develop students' knowledge of some of the tools available in the .NET Framework Class Library. The course will also improve students' knowledge of the C # programming language and teach how to apply object-oriented architecture and design principles to .NET applications written in C # .NET.
Expected results of the study (acquired by students knowledge, skills and competence)	□ Creation of console / window applications in Visual Studio .NET; □ Create and use classes and objects in a C # application; □ Use the concepts of encapsulation, inheritance and polymorphism in console / window applications; □ Handling process error; □ Creature charts and so. □ Explain drawn up software documentation.

Discipline description	
Discipline Code	SFT6512
Name of the discipline	Programming in Java 2
Number of credits (ESTS)	6
Course, semester	3, 5
Department name	MCM
Course author (s)	Olzhaev O.
Prerequisites	Programming in Java 1
Post-requisites	-
The purpose of studying the discipline	Development of the skills acquired by students in the framework of the courses "Programming in the Java 1 language", and improving the skills of programming in the Java language.
Brief description of the course (main sections)	The student will gain the skills necessary to work in real projects and understand what lies at the heart of many popular frameworks, how they work. Student get acquainted and study the architecture of different platforms.
Expected results of the study (acquired by students knowledge, skills and competence)	Students will learn how to design object-oriented applications and create Java programs using hands-on exercises and tools. And also high-level Java programming, writing class loader and unit tests.

Discipline description	
Discipline Code	SFT6522
Name of the discipline	Programming in C# 2
Number of credits (ESTS)	6
Course, semester	3, 5
Department name	MCM
Course author (s)	Zhanabekov Zh.
Prerequisites	Programming in C# 1
Post-requisites	-
The purpose of studying the discipline	Development of the skills acquired by students in the framework of the courses "Programming in the C # 1 language", and improving the skills of programming in the C # language.
Brief description of the course (main sections)	The course examines in detail the capabilities of the language and auxiliary libraries that are most in demand when developing applications and autotests, including when testing web and windows applications through the user interface. The course will help you learn how powerful the combination of C # 5.0 and .NET 4.5 is.
Expected results of the study (acquired by students knowledge, skills and competence)	A large number of examples will help you when working with features of C # code such as generics, dynamic typing, and the new features of asynchronous programming. In addition, the student will learn about all the intricacies of working with XAML, ASP.NET, LINQ and other tools of the .NET platform.

Discipline description	
Discipline Code	BIO6516
Name of the discipline	Laplace transformation in biological problems
Number of credits (ESTS)	5
Course, semester	4, 8
Department name	MCM
Course author (s)	Rysbayuly B.
Prerequisites	General Biology, Mathematical Analysis
Post-requisites	-
The purpose of studying the discipline	Study the Laplace transform to understand biological systems.
Brief description of the course (main sections)	This course focuses on the concept of the system transfer function. Also called a system function, a transfer function fully describes the response of a system to any input signal in a very conceptual manner. This visualization does not take place in the time domain, where we usually observe the behavior of systems, but rather in the "frequency domain". We need a device to transition from the time domain to the frequency domain; this is the Laplace transform.
Expected results of the study (acquired by students knowledge, skills and competence)	Students will learn how to work with the Laplace transform in biological problems.

Discipline description	
Discipline Code	EGR6536
Name of the discipline	Simulation of ill-posed problems
Number of credits (ESTS)	5
Course, semester	4, 8
Department name	MCM
Course author (s)	Rysbayuly B.
Prerequisites	Numerical Methods, Algorithms and Data Structures, Introduction to Programming
Post-requisites	-
The purpose of studying the discipline	To acquaint students with the main methods of solving incorrectly posed practical tasks.
Brief description of the course (main sections)	Models of heat propagation in a multilayer region are considered. Approximate methods for solving ill-posed problems of artificial structures are being developed, algorithms for solving various types of inverse problems are being developed. Computational experiments are carried out, output data are analyzed.
Expected results of the study (acquired by students knowledge, skills and competence)	At the end of this course, students will be ready to apply methods for solving incorrectly posed practice problems.