

Faculty of Computer Technology and Cybersecurity

Department of “Radio engineering, electronics and telecommunications”

APPROVED BY  
Vice-rector for academic affairs,  
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Mustafina A.K.  
(Signature) (Full name)  
03 2023



B059 – Communications and communication technology

6B06201 – Telecommunication systems and networks

(Name of Academic Program)

## CATALOGUE OF ELECTIVE DISCIPLINES

for 2023 year of enrollment

The catalogue of elective disciplines for the specialty/AP 6B06201 – Telecommunication systems and networks 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 department of “Radio engineering, electronics and telecommunications”

minutes No. 7 from “09” 02 20  .

Head of Department



signature

Bakhtiyarova, Ye.A. C.T.S.

Full name, position, degree

CED compiler



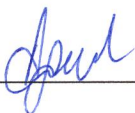
signature

Kabatayeva R.S., PhD

Full name, position, degree

The catalogue of elective disciplines was approved at a meeting of the Academic Council of “International Information Technology University” JSC minutes No. 3 from « 14 » 03 2023.

Head of the Department



A. Ajibayeva

for Educational and Methodological Affairs

## 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**

<b>Cycle of discipline</b>	<b>Code of discipline</b>	<b>Name of discipline</b>	<b>Se m</b>	<b>Number of credits</b>	<b>Prerequisites</b>
<b>Basic disciplines</b>					
<b>Elective disciplines</b>					
<b>2<sup>nd</sup> year</b>					
Elective group - 1	EEC 6608	Computer and mathematical modeling	4	4	Information and communication technology (in English)
	EGR 6600	Engineering and computer graphics			Information and communication technology (in English)
<b>3<sup>rd</sup> year</b>					
Elective group - 2	EEC 6641	Programming in C++ (1)	5	4	Information and communication technology (in English)
	EEC 6642	Programming in Phyton (1)			Information and communication technology (in English)
	EEC 6643	Programming in Java (1)			Information and communication technology (in English)
<b>Profile disciplines</b>					
<b>Elective disciplines</b>					
<b>3<sup>rd</sup> year</b>					
Elective group - 3	EEC 6644	Programming in C++ (2)	6	4	Programming in C++ (1)
	EEC 6645	Programming in Phyton (2)			Programming in Phyton (1)
	EEC 6646	Programming in Java (2)			Programming in Java (1)
<b>4<sup>th</sup> year</b>					
Elective group - 4	EEC 6658	Organization and protection of information security in corporate networks	8	4	Introduction to network technologies
	EEC 6659	Software-defined networks organization			Introduction to network technologies

### 3 DESCRIPTION OF ELECTIVE DISCIPLINES

#### Basic disciplines

##### Description of discipline 1

Description of discipline 1	
Code of discipline	EEC 6608
Name of discipline	<b>Computer and mathematical modeling</b>
Number of credits (ECTS)	4 ECTS (1+0+2)
Course, semester	2, 4
Department	Radio engineering, electronics and telecommunications
Course author (s)	Ibraeva Zh.B.
Prerequisites	Information and communication technology (in English)
Postrequisites	Digital signal processing
The aim of study of a discipline	Teach students the basics of mathematical modeling, programming in the Matlab package for organizing technical calculations.
Brief course description (main sections)	The discipline provides for the study of the basics of mathematical and computer modeling using the MATLAB package. Skills of data visualization, sound system support are acquired. Problems with matrices, vectors, lists, with program structures such as loops and branches are solved.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of studying the course, students should be able to: <ul style="list-style-type: none"> <li>• Present the criteria for creating mathematical modeling;</li> <li>• Display graphs of elements of one-dimensional and two-dimensional arrays;</li> <li>• Calculate using Matlab mathematical functions;</li> <li>• Assess the benefits of using difference and differential equations depending on the model.</li> </ul>

##### Description of discipline 1

Description of discipline 1	
Code of discipline	EGR 6600
Name of discipline	<b>Engineering and computer graphics</b>
Number of credits (ECTS)	4 ECTS (1+0+2)
Course, semester	2, 4
Department	Radio engineering, electronics and telecommunications
Course author (s)	Ibraeva Zh.B.
Prerequisites	Information and communication technology (in English)
Postrequisites	Computer systems in radio engineering
The aim of study of a discipline	study of the theoretical foundations for the implementation and reading of engineering drawings in the specialty (radio engineering diagrams)
Brief course description (main sections)	The discipline is designed to give the student practical methods for constructing technical drawings for solving engineering problems.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of studying this discipline, students should: <ul style="list-style-type: none"> <li>• understand the theoretical foundations of building images - complex and axonometric;</li> <li>• apply the rules for the execution and design of drawings;</li> <li>• be able to perform various geometric constructions and projection images using the AutoCAD system.</li> </ul>



**Description of discipline 2****Description of discipline 2**

Code of discipline	EEC 6641
Name of discipline	<b>Programming in C++ (1)</b>
Number of credits (ECTS)	4 (1+0+2)
Course, semester	3 course, 5 sem
Department	Radioengineering. Electronics and Telecommunications
Course author (s)	Senior-lecturer. Kamal R.Zh.
Prerequisites	Information and communication technology (in English)
Postrequisites	Programming in C++ (2)
The aim of study of a discipline	<p>Course Objectives:</p> <ul style="list-style-type: none"> <li>• provide the student with basic knowledge in the field of imperative programming and algorithms;</li> <li>• to provide the student with sufficient knowledge in these areas so that he can be prepared to take advanced courses in these areas;</li> <li>• provide the student with the knowledge in these areas necessary to continue his/her main course of study in science or engineering;</li> <li>• to develop the student's analytical approach to solving problems both in science and in "everyday life";</li> <li>• to develop in the student an understanding of the role of science in our modern society, as well as in the past and in the future.</li> </ul>
Brief course description (main sections)	History of C++. Variables and types. Block diagram. Building blocks. Declaring variables. Operators. Iterative operators (cycles). Arrays. Multidimensional arrays. Character sequences. Functions. Recursion. Recursive function. Data structures. Pointers. Files. Pointers and arrays. Sorting. Sorting. Classes.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	<p>Students who have studied the course "Programming in C++ (1)" will be able to solve the following professional tasks</p> <ul style="list-style-type: none"> <li>• to formulate the basic concepts and principles for solving problems related to computer science;</li> <li>• determine the types of variables for solving practical problems;</li> <li>• compare and contrast different ways of solving a problem after testing the program;</li> <li>• explain the developed program documentation;</li> <li>• List data structures, operators, and basic algorithmic constructs in C++.</li> </ul>

**Description of discipline 2****Description of discipline 2**

Code of discipline	EEC 6642
Name of discipline	<b>Programming in Python (1)</b>
Number of credits (ECTS)	4 (1+0+2)
Course, semester	3 course, 5 sem
Department	Radioengineering. Electronics and telecommunications
Course author (s)	Senior-lecturer. Kamal R.Zh.
Prerequisites	Information and communication technology (in English)
Postrequisites	Programming in Python(2)
The aim of study of a discipline	The goal of this course is to teach the student the basics of computer programming using Python. We will cover the basics of how you can build a program based on a series of simple instructions in Python.



	The course has no prerequisites and does not include any math material other than the most elementary.
Brief course description (main sections)	This course teaches the basics of Python 3 programming. We'll start at the very beginning with variables, conditions, and loops, and move on to some intermediate stuff like keyword parameters, list comprehensions, lambda expressions, and class inheritance.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of mastering the discipline, the student must: Be able to write relatively advanced, well structured computer programs in Python Be familiar with the principles and methods of optimization Performance of Numeric Python Applications

### Description of discipline 2

Description of discipline 2	
Code of discipline	EEC 6643
Name of discipline	<b>Programming in Java (1)</b>
Number of credits (ECTS)	4 ECTS (1 + 0 + 2)
Course, semester	3 course, 5 sem
Department	Radioengineering. Electronics and telecommunications
Course author (s)	Senior-lecturer. Kamal R.Zh
Prerequisites	Information and communication technology (in English)
Postrequisites	Programming in Java (2)
The aim of study of a discipline	Learn front-end development from determining the functionality of websites to web page layout and back-end development using modern web technologies.
Brief course description (main sections)	The course content covers the following web technologies: REST API, JAX RS, Hibernate ORM, Spring MVC Framework, Spring Security, Tomcat Server, Servlet API, JSP. During the semester, students will learn the development of enterprise systems in the Java programming language, as well as the correct use of servlets and JSP. Students must understand the MVC pattern while developing a secure web application. Students will be able to practice real web projects and assignments. In addition, students will be able to explore new trending technologies through research.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Upon successful completion of the course, students will be able to: <ul style="list-style-type: none"> <li>– analyze advanced web technologies to solve various types of problems,</li> <li>– explain and justify the use of java web development tools for specific purposes</li> <li>– know the Java programming language, the basics of servlets and JSP (Java Server Pages).</li> <li>– ORM library hibernation.</li> <li>– develop secure corporate server-client web applications.</li> </ul> implement a solution to the problem using the selected algorithms in a familiar software and analytical environment

### Profile disciplines

#### Description of discipline 3

Description of discipline 3	
Code of discipline	EEC 6644



Name of discipline	<b>Programming in C++ (2)</b>
Number of credits (ECTS)	4
Course, semester	3, 6
Department	Radioengineering. Electronics and telecommunications
Course author (s)	Senior-lecturer. Kamal R.Zh.
Prerequisites	Programming in C++ (1)
Postrequisites	Programming in embedded systems, Diploma project
The aim of study of a discipline	<p>Course Objectives:</p> <ul style="list-style-type: none"> <li>• provide the student with the knowledge in these areas necessary to continue his/her main course of study in science or engineering;</li> <li>• develop the student's analytical approach to solving problems both in science and in "everyday life";</li> <li>• to develop in the student an understanding of the role of science in our modern society, as well as in the past and in the future.</li> </ul>
Brief course description (main sections)	<p>This course is a continuation of the C++ Programming (1) course. In it, we continue to get acquainted with the possibilities of the C++ language. The course covers:</p> <ul style="list-style-type: none"> <li>- C++ integer types</li> <li>- pairs and tuples</li> <li>- function templates</li> <li>- inheritance and polymorphism</li> <li>- iterators and standard algorithms</li> <li>- distribution of code across multiple files</li> </ul>
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	<p>Students who have studied the course "Programming in C++ (2)" will be able to solve the following professional tasks</p> <ul style="list-style-type: none"> <li>• compare and contrast different ways of solving a problem after testing the program;</li> <li>• explain the developed program documentation;</li> <li>• List data structures, operators, and basic algorithmic constructs in C++.</li> <li>• Be able to write relatively advanced, good structured computer programs in C++.</li> </ul>

### Description of discipline 3

#### Description of discipline 3

Code of discipline	EEC 6645
Name of discipline	<b>Programming in Python (2)</b>
Number of credits (ECTS)	4
Course, semester	3, 6
Department	Radioengineering. Electronics and telecommunications
Course author (s)	Senior-lecturer. Kamal R.Zh.
Prerequisites	Programming in Python (1)
Postrequisites	Programming in embedded systems, Diploma project
The aim of study of a discipline	<p>Learn to write relatively advanced, well-structured computer programs in Python; be familiar with the principles and techniques for optimizing the performance of numerical Python applications; have understanding of parallel computing and how parallel applications can be written in Python; experiment with developing GPU-accelerated Python applications; develop applications in Python, using big data services such as Hadoop and Spark.</p>



Brief course description (main sections)	In this course, we will cover a number of advanced techniques improve the performance of programs on including the use of parallel computing and GPU acceleration. We will also look at how Python can Use for analysis big using frameworks such as Apache Hadoop and Apache Spark. Students will have the opportunity use these methods and gain hands-on experience development of advanced applications in Python.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of mastering the discipline, the student must: Be able to write relatively advanced, well structured computer programs in Python Be familiar with the principles and methods of optimization Performance of Numeric Python Applications Understand parallel computing and how parallel applications can be written in Python Experiment with developing Python applications with GPU acceleration Develop applications in Python using big data services like Hadoop and Spark

### Description of discipline 3

Description of discipline 3	
Code of discipline	EEC 6646
Name of discipline	<b>Programming in Java (2)</b>
Number of credits (ECTS)	4
Course, semester	3, 6
Department	Radioengineering. Electronics and telecommunications
Course author (s)	Senior-lecturer. Kamal R.Zh.
Prerequisites	Programming in Java (1)
Postrequisites	Programming in embedded systems, Diploma project
The aim of study of a 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, conditionals). Finally, it will include a brief introduction to the Java Framework and Java JDBC.
Brief course description (main sections)	This course has been designed to introduce the student to the Java language. Java GUI, Java Database will be studied in this course. The unique architecture of Java allows programmers to develop a single application that can run seamlessly and reliably across multiple platforms. In this hands-on course, students gain extensive experience with Java and its object-oriented features. Students learn how to build robust console and graphical applications as well as store and retrieve data from relational databases.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	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, class members, and relationships between them that are necessary for a particular problem. Build Java applications using robust OOP techniques (eg interfaces and APIs) and proper program structuring (eg use of access control identifiers, automatic documentation via comments, error exception handling).

**Description of discipline 4**

<b>Description of discipline 4</b>	
Code of discipline	EEC 6658
Name of discipline	<b>Organization and protection of information security in corporate networks</b>
Number of credits (ECTS)	4
Course, semester	4, 8
Department	Radioengineering. Electronics and Telecommunications
Course author (s)	Bakhtiyarova E.A.
Prerequisites	Introduction to network technologies
Postrequisites	Diploma project
The aim of study of a discipline	Study of various types of architecture and design features, protection, operation of corporate networks, as well as troubleshooting in their operation.
Brief course description (main sections)	The course covers Wide Area Network (WAN) technologies and quality of service (QoS) mechanisms used for secure remote access. Students gain skills in setting up and diagnosing corporate networks, learn to identify and neutralize cybersecurity threats.

**Description of discipline 4**

<b>Description of discipline 4</b>	
Code of discipline	EEC 6659
Name of discipline	<b>Software-defined networks organization</b>
Number of credits (ECTS)	4
Course, semester	4, 8
Department	Radioengineering. Electronics and Telecommunications
Course author (s)	Bakhtiyarova E.A.
Prerequisites	Introduction to network technologies
Postrequisites	Diploma project
The aim of study of a discipline	Study of architecture, protection and maintenance of corporate networks. Students get acquainted with the concepts of a software-defined network, virtualization, and automation, that is, the basics of modern digital networks.
Brief course description (main sections)	Students form the skills of setting up corporate networks, finding and troubleshooting problems in their work. They get a basic understanding of network management tools and learn the basic principles of organizing software-defined networks, including controller-based architectures and automation of network processes using application programming interfaces (APIs).