ХАЛЫҚАРАЛЫҚ АҚПАРАТТЫҚ ТЕХНОЛОГИЯЛАР УНИВЕРСИТЕТІ
МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ
INTERNATIONAL UNIVERSITY OF INFORMATION TECHNOLOGY

Faculty of Computer Technology and Cybersecurity
Department of Computer Engineering and Information Security

APPROVED BY
Vice-rector for academic affairs,
International Information
Technology University JSC
_____ Umarov T.F.
"31" 03 2021

6B06302
(Code of Academic Program)

Hardware security
(Name of Academic Program)

CATALOGUE OF ELECTIVE DISCIPLINES

2021 entry year

2021

The catalogue of elective disciplines for the specialty/AP 6B06302 Hardware security 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 and Information Security department

minutes No. 7 from "15" 02 2021

~~Acting~~ Head of Dep _____ M.T. Ipalakova

CED compiler _____ S.T. Amanzholova

_____ A.O. Sagymbekova

_____ B.B. Imankulova

The catalogue of elective disciplines was approved at a meeting of the Academic Council of JSC IITU

minutes No. 4 from "30" 03 2021

Head of the Department
of Academic Affairs _____ A.K. Mustafina

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

№	Cycle of discipline	Code of discipline	Name of discipline	Semester	Number of credits	Prerequisites
2 year						
1	BD	SFT6204	Python programming language	4	5	SFT6202 Object-Oriented programming language (Java)
3 year						
2	BD	SFT6308	System programming	6	6	SFT620 Algorithmization and Programming
3	PD	HRD6202	IoT technology	5	4	NET6201Computer Networking Basics
4	PD	EEC6003	Design and simulation of electronic devices	5	5	EEC6005Fundamentals of Logic Design
5	PD	HRD6203	Computer Systems Architecture	6	4	EGR6201Basics of the Linux operating system
4 year						
6	PD	EGR6201	Digital signal processing	7	6	EEC6003Design and simulation of electronic devices
7	PD	SEC6215	IoT security	7	6	HRD6202 IoT technology
8	PD	SEC6216	Biometric Access Control Systems	7	6	EEC6003Design and simulation of electronic devices
9	PD	HRD6204	Microcontroller Programming	7	6	EEC6003Design and simulation of electronic devices

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Discipline description	
Code of discipline	SFT6204
Name of discipline	Python programming language
Number of credits (ECTS)	5
Course, semester	2,4
Department	CE&IS
Prerequisites	SFT6202 Object-Oriented programming language (Java)
Postrequisites	Diploma project
Brief course description	This course is designed to familiarize students with the Python programming language and its libraries. The structure of the course focuses on procedural programming, algorithm design, application work forms (libraries), object-oriented programming, creating web and database applications, and data preprocessing using pandas and numpy. In addition, this course provides students with an understanding of the use of lax variable types.
Expected learning outcomes	Code, test, build, and debug full-featured and complex applications in the Python programming language.

Description of discipline	
Code of discipline	SFT6308
Name of discipline	System programming
Number of credits (ECTS)	6
Course, semester	3, 6
Department	CE&IS
Prerequisites	SFT620 Algorithmization and Programming
Postrequisites	Diploma project
Brief course description	The aim of the course is to learn the basics of a computer system, including the programming language Assembler, program optimization, and basic concepts of embedded systems. In this course, students will explore the process of learning about hardware and software. They will study in detail the memory hierarchy - registers, cache memory, RAM, ROM and external memory.
Expected learning outcomes	After successful completion of the course students will be able to: - programming in low-level language - Assembler, for a better understanding of how modern computers are arranged; - analyze and understand the structure of the memory hierarchy - registers, cache memory, RAM, ROM and external memory.

Description of discipline	
Code of discipline	HRD6202
Name of discipline	IoT technology
Number of credits (ECTS)	4
Course, semester	3, 5
Department	CE&IS
Prerequisites	NET6201Computer Networking Basics

Postrequisites	Diploma project
Brief course description	The course provides knowledge and skills of the principles of organization and functioning of the IoT. The course is aimed at studying existing technologies in the field of IoT, the main trends and directions. As part of the course, students will be able to get acquainted with physical, technical and mathematical concepts. The acquired knowledge will be applied in creative projects for solving problems, which are accompanied by the use of electronic tools integrated into the programming environment.
Expected learning outcomes	After successful completion of the course students will be able to: - analyze the main components of the IoT; - build systems of sensors/actuators using the Arduino microcontroller; - Create Python programs that provide IoT functionality for the Raspberry Pi single board computer.

Description of discipline	
Code of discipline	EEC6003
Name of discipline	Design and simulation of electronic devices
Number of credits (ECTS)	5
Course, semester	3, 5
Department	CE&IS
Prerequisites	EEC6005Fundamentals of Logic Design
Postrequisites	Diploma project
Brief course description	The modern way of life demand from the students good theoretical background and what is particularly important, practical knowledge and skills, which are very important in a market economy. This course provides a basic understanding of the semiconductor materials - characteristics, working principles and applications; provides the insight useful for understanding semiconductor devices and technologies; semiconductor physics, p-n junctions diodes, metal-semiconductor contacts, heterojunctions, transistors.
Expected learning outcomes	After successful completion of the course students will be able to: – analyze semiconductor devices, through numerical problems, using fundamental characteristics of semiconductor materials, such as carrier densities, transport, lifetime, generation and recombination; – use basic governing equations to calculate carrier concentrations, position of Fermi energy level, carrier drift current in given field, built - in potential barrier at the space charge region, and current-voltage characteristics of p- n junctions; – analyze main characteristics of electronic and optoelectronic devices such as BJTs, MOSFETs and LEDs.

Description of discipline	
Code of discipline	HRD6203
Name of discipline	Computer Systems Architecture
Number of credits (ECTS)	4
Course, semester	3, 6
Department	CE&IS

Prerequisites	EGR6201Basics of the Linux operating system
Postrequisites	Diploma project
Brief course description	This course describes the structure, function, and characteristics of computer systems. The basis of this course is the design and analysis of the structure and functions of modern computing systems. Design and analysis of the structure and function of modern computing systems. Topics studied include combinational and sequential logic, number systems and computer arithmetic, hardware design and organization of CPU, I/O systems and memory systems, instruction set and assembly language design, performance characterization and measurement, and current trends and developments in computer architecture and organization.
Expected learning outcomes	After successful completion of the course students will be able to: - to design a combinational logic circuit using logic gates; - know the scheme for constructing sequential logic that use flip-flops and combinational logic; - know the elements of memory such as registers and RAM; - to program microcontrollers based on a logic circuit.

Description of discipline	
Code of discipline	EGR6201
Name of discipline	Digital signal processing
Number of credits (ECTS)	6
Course, semester	4, 7
Department	CE&IS
Prerequisites	EEC6003 Design and simulation of electronic devices
Postrequisites	Diploma project
Brief course description	The course is aimed at studying the basic provisions of the theory of digital signal processing, the basics of analytical and numerical methods for calculating and analyzing digital signal converters and developing skills in designing digital signal converters. The course covers the basics of signal analysis, spectrum analysis, analog and discrete systems. When studying the discipline, attention should be paid to solving the following problems: theoretical training in the field of digital signal processing, the practical application of knowledge for spectral and correlation analyzes, as well as for designing digital filters.
Expected learning outcomes	After successful completion of the course students will be able to: - know the methods of mathematical description of linear discrete systems. - be able to perform computer modeling of linear discrete systems based on their mathematical description. - possess the skills of drawing up mathematical models of linear discrete systems and discrete signals. - possess the skills of computer modeling of linear discrete systems.

Description of discipline	
Code of discipline	SEC6215
Name of discipline	Internet of things security
Number of credits (ECTS)	6
Course, semester	4, 7

Department	CE&IS
Prerequisites	HRD6202 IoT technology
Postrequisites	Diploma project
Brief course description	The discipline provides fundamental knowledge of Internet of Things (IoT) applications, including basic components such as IoT devices, low-power networking solutions and middleware solutions, as well as related security and privacy issues regarding these components.
Expected learning outcomes	After successful completion of the course students will be able to: - demonstrate understanding of IoT Security fundamentals and solutions; - analyse IoT security algorithms, architecture and approaches. - validate IoT security mitigation, including software-defined-security for networks, and clouds.

Description of discipline	
Code of discipline	SEC6216
Name of discipline	Biometric Access Control Systems
Number of credits (ECTS)	6
Course, semester	4, 7
Department	CE&IS
Prerequisites	EEC6003 Design and simulation of electronic devices
Postrequisites	Diploma project
Brief course description	This course describes methods for obtaining biometric data; The basic methods of digital processing of signals and images used for biometric identification are studied.
Expected learning outcomes	After successful completion of the course students will be able to: - apply methods of recognition of control patterns; - to use technical means to obtain initial biometric data; - be able to design devices, devices and systems.

Description of discipline	
Code of discipline	HRD6204
Name of discipline	Microcontroller Programming
Number of credits (ECTS)	6
Course, semester	4, 7
Department	CE&IS
Prerequisites	EEC6003 Design and simulation of electronic devices
Postrequisites	Diploma project
Brief course description	This course will provide hands-on experience with microcontroller systems. On the course, students study the typical architecture and internal blocks of the microcontroller, different types of memory. Interfacing analog and digital signals, including the basics of electronics. C programming, drivers. Study of instruction sets and registers and addressing modes for a given family of microcontrollers. Planning and implementation of a microcontroller-based project.

Expected learning outcomes	After successful completion of the course students will be able to: - independently design and implement an embedded system based on an eight bit microcontroller, taking into account energy conservation and possible software errors, - program a microcontroller using C, including hardware configuration and interrupt service routines, - manage parallel processes with different priority and real time constraints without the aid of an operating system, - select data types and algorithms suitable for the architecture and instruction set of a given microcontroller, - give a detailed description of limitations of the chosen system design, debug a microcontroller application using different tools.