Faculty of Computer Technology and Cybersecurity
Department of Cybersecurity

6B06301

Computer Security

CATALOGUE OF ELECTIVE DISCIPLINES

2023 entry year

2023

The catalogue of elective disciplines for the specialty/AP 6B06301 - Computer Security is developed on the basis of the working curriculum of the specialty/AP.
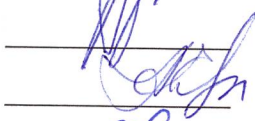
The catalogue of elective disciplines was discussed at a meeting of the Cybersecurity department

minutes No. _2_ from «_03_» _11_ 2023

Head of Department	_____	S.T. Amanzholova
CED compilers	_____	S.T. Amanzholova
	_____	A.O. Sagymbekova
	_____	N.Y. Askarbekova

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

minutes No. _2_ from «_03_» _11_ 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.

2 ELECTIVE DISCIPLINES

№	Cycle of discipline	Code of discipline	Name of discipline	Semester	Number of credits	Prerequisites
3 year						
1	BD	SEC6233	Introduction to Intelligent Cybersecurity	6	4	MAT6018 Mathematical foundations of information security
2	BD	SEC6243	Information recovery technologies	6	4	EGR6202 Information Theory
3	PD	MIN601	Minor 1	5	5	
4	PD	MIN602	Minor 2	6	5	
4 year						
5	OOD	ECO6004	Economics and organization of production	8	5	SPS6002 Sociology
6	OOD	MGT6706	Startups and entrepreneurship	8	5	SPS6002 Sociology
7	OOD	JUR 6470	Fundamentals of law and anti-corruption culture	8	5	SPS6002 Sociology
8	OOD	JUR 6507	Fundamentals of ecology and life safety	8	5	SPS6002 Sociology
9	PD	SEC6205	Mobile technology security	7	4	SFT6207 Object-oriented Programming (Java)
10	PD	SEC6234	Introduction to Cloud Technologies	7	4	EGR6202 Information Theory
11	PD	SFT6206	Development of corporate applications on the Django framework	7	6	SFT6202 Object-oriented Programming (Java)
12	PD	SEC6244	Identity and Access management	7	6	SFT6211 Organization of database management systems
13	PD	MIN603	Minor 3	7	5	
14	PD	SEC6236	Protection of applications and scripts from modifications	8	5	SFT6203 Web Technologies
15	PD	NET6207	DevNet	8	5	NET 6201 Fundamentals of Computer Networks
16	PD	SEC6238	Blockchain Technologies	8	4	MAT6018 Mathematical foundations of information security
17	PD	SEC6245	Cyberdisk and cyber intelligence	8	4	SEC6201 Computer Information Protection Technologies

18	PD	SEC6222	Reverse engineering	8	4	SFT6204 Python Programming Language

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Discipline description	
Code of discipline	ECO6004
Name of discipline	Economics and organization of production
Number of credits (ECTS)	5
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	SPS6002 Sociology
Postrequisites	Graduation project
Brief course description	Enterprise economics is a system of knowledge related to the process of developing and making business decisions in the course of the company's activities. Therefore, the economy of an enterprise, as a system of knowledge and methods of managing the economic activity of an enterprise, occupies an important place in the organization of production and distribution of goods in any economic system. The course introduces the production structure of the enterprise, in relation to the type of production, the organization of the production cycle, issues of technical preparation of production and the creation of the necessary production infrastructure, innovative activity of the enterprise, product quality, investment policy of the enterprise, environmental issues, foreign economic activity of the enterprise and the organization of the enterprise management process as a whole.
Expected learning outcomes	To form fixed and circulating funds, to use capital, to receive and distribute the income (profits) of the enterprise. Develop strategies for the economic activity of the enterprise, plan production and sales of products. To know the financial resources of the enterprise, the efficiency of economic activity, to assess the risk in entrepreneurship. To solve the issues of material and technical support of production: supply of raw materials, materials, formation of stocks and their rational use.

Discipline description	
Code of discipline	MGT6706
Name of discipline	Startups and entrepreneurship
Number of credits (ECTS)	5
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	SPS6002 Sociology
Postrequisites	Graduation project
Brief course description	A startup is a commercial project based on an idea and requires financing for development related to entrepreneurship. The course introduces the formation of a business idea that solves a real consumer problem, the launch of a minimum viable product (MVP) to test a hypothesis, the achievement of product-market fit - acceptance of the product by the market, scaling of the project through investments in advertising, attracting partners and achieving maturity — a stable position in the market.
Expected learning outcomes	"Consumer identification", during which a startup builds hypotheses about how its product solves the problems of potential customers. "Consumer verification", the stage of hypothesis testing and preparation of a sales plan, marketing strategy, search for early followers of the company. In case of failure at this stage, the startup returns to identifying its consumers.

	"Attracting consumers" after confirming the usefulness of the company's product. The startup is moving to product sales and marketing investments.
	"Creating a company" is the ultimate goal of a startup, creating a formal company structure and business processes for further development.

Discipline description

Code of discipline	JUR 6470
Name of discipline	Fundamentals of law and anti-corruption culture
Number of credits (ECTS)	5
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	SPS6002 Sociology
Postrequisites	Graduation project
Brief course description	The aim of the course is to understand the basics of anti-corruption culture, to develop the ability to describe the essence and causes of corruption in society. The course forms the acquisition of skills to work with legislation in the field of anti-corruption, and develops a civic attitude to this phenomenon. This course is aimed at improving the anti-corruption culture and the formation of moral and legal responsibility for corruption offenses.
Expected learning outcomes	Develops knowledge, skills and anti-corruption skills. Knows the basics of law

Discipline description

Code of discipline	JUR 6507
Name of discipline	Fundamentals of ecology and life safety
Number of credits (ECTS)	5
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	SPS6002 Sociology
Postrequisites	Graduation project
Brief course description	The purpose of the course is to study the basics of life safety and environmental protection, teaching the goals and objectives of the methodology, methods used in the process of planning and conducting classes, and ways to use modern new technologies in the classroom.
	The course introduces the issues of theoretical and practical foundations of safety, harmlessness and facilitation of working conditions at its maximum productivity, on the legislative and regulatory framework in the field of labor protection. Legislative acts. Organizational and theoretical foundations of life safety. Concepts and definitions.
Expected learning outcomes	Be able to be guided by ethical and legal norms of relations to a person, society, and the environment.
	Possess knowledge about the factors affecting the technical and economic efficiency of production.
	Be able to identify hazards and assess risks in the field of occupational safety at work.
	Be able to apply professional knowledge to minimize negative technogenic consequences, ensure safety and improve working conditions in the field of their professional activities.

Discipline description

Code of discipline	SEC6233
Name of discipline	Introduction to Intelligent Cybersecurity

Number of credits (ECTS)	4
Course, semester	3,6
Department	CYBERSECURITY
Prerequisites	MAT6018 Mathematical foundations of information security
Postrequisites	SEC6206 Cryptographic methods of information protection
Brief course description	The Intelligent Cybersecurity Intelligence System (CIS) protects against APT attacks using technologies such as big data analytics and machine learning. To protect key information resources, CIS accurately identifies APT threats and prevents attacks. The system allows you to restore the "killer chain" in APT attacks by extracting key information from a large array of data, assessing risks in several directions and comparing isolated suspicious areas based on the results of big data analysis. The purpose of the course is to gain theoretical knowledge, skills and practical skills on intellectual security issues. The acquired knowledge, skills and abilities will allow students to navigate the issues of intellectual cybersecurity and continue their cybersecurity studies in more advanced courses. This course develops the ability to analyze possible security threats, the ability to choose and apply various methods of protection with the help of AI.
Expected learning outcomes	To develop the skills of safe use of the Internet, selection and application of various ways to protect your personal data, analysis of possible security threats based on the AI system.

Discipline description	
Code of discipline	NET6207
Name of discipline	DevNet
Number of credits (ECTS)	5
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	NET 6201 Fundamentals of Computer Networks
Postrequisites	Graduation project
Brief course description	This course introduces the methodologies and tools of modern software development used in OT and network operations. It covers a complete overview of the subject area, including microservices, testing, containers and DevOps, as well as secure infrastructure automation using application programming interfaces (APIs).
Expected learning outcomes	Get hands-on, up-to-date hands-on laboratory experience, including Python programming, using GIT and common data formats (JSON, XML and YAML), deploying applications as containers, using continuous integration/continuous deployment pipelines (CI/CD) and automating infrastructure using code. Developing skills for entry-level software development and infrastructure automation

Discipline description	
Code of discipline	SEC6222
Name of discipline	Reverse engineering
Number of credits (ECTS)	4
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	SFT6204 Python Programming Language
Postrequisites	Graduation project

Brief course description	Reverse engineering of code (reverse code development) is the process of analyzing the machine code of a program, which aims to understand the principle of operation, restore the algorithm, detect undocumented features of the program, etc. The main methods of reverse engineering are static or dynamic code analysis. In static analysis, the researcher disassembles the program code using special software, and then analyzes the assembler code. In dynamic analysis, the researcher runs the code in an isolated environment (sandbox) or debugger and analyzes the code dynamically.
Expected learning outcomes	Independent analysis of the logic and contents of executable files and investigation of the consequences of malicious executable files in the OS. Performing reverse engineering of compiled executable files and debugging executable files. Creating your own rules for finding signatures in static analysis. Debugging executable files

Discipline description

Code of discipline	SFT6206
Name of discipline	Development of corporate applications on the Django framework
Number of credits (ECTS)	6
Course, semester	4,7
Department	CYBERSECURITY
Prerequisites	SFT6202 Object-oriented Programming (Java)
Postrequisites	Graduation project
Brief course description	Django is a full-featured server-side web framework written in Python. The Django framework copes with a large number of tasks and increased loads. It is used to create: CRM systems, CMS, Communication platforms, room booking services, document management platforms. The course studies the creation of modern web applications on this framework.
Expected learning outcomes	-design and build Django web applications -testing Django web applications -using the built-in tools of the framework to ensure the security of the web application

Discipline description

Code of discipline	SEC6238
Name of discipline	Blockchain Technologies
Number of credits (ECTS)	5
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	MAT6018 Mathematical foundations of information security
Postrequisites	Graduation project
Brief course description	Blockchain is a technology for encrypting and storing data distributed across multiple computers connected to a common network. This course describes a digital database of information that reflects all transactions made, records in the blockchain, presented in the form of blocks interconnected by special keys.
Expected learning outcomes	After successful completion of the course, students will: -know the principles of blockchain, -use blockchain for storing and transmitting digital data.

Discipline description	
Code of discipline	SEC6205
Name of discipline	Mobile technology security
Number of credits (ECTS)	4
Course, semester	4,7
Department	CYBERSECURITY
Prerequisites	SFT6207 Object-oriented Programming (Java)
Postrequisites	Graduation project
Brief course description	The discipline provides knowledge on the use of tools for programming and designing mobile applications, on the development of user interfaces for mobile applications, on the use of software functions that support telephony, sending /receiving SMS, connection management via Wi-Fi, Bluetooth, programming background services, notification and alarm mechanisms, interaction of applications with geolocation and mapping services.
Expected learning outcomes	After successful completion of the course, students will: -know the basics of mobile technology security -apply the knowledge gained in practice.

Discipline description	
Code of discipline	SEC6236
Name of discipline	Protection of applications and scripts from modifications
Number of credits (ECTS)	5
Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	SFT6203 Web Technologies
Postrequisites	Graduation project
Brief course description	This course includes software security theory and practice, focusing on some common software security risks, including buffer overflow, random number generation, and identifying potential threats and vulnerabilities early in the design cycle. Particular attention is paid to methodologies and tools for identifying and eliminating security vulnerabilities, methods for proving the absence of vulnerabilities, ways to prevent security vulnerabilities in new software, and basic guidelines for creating secure software: how to develop security-aware software from scratch and integrate risk analysis and management throughout the software lifecycle.
Expected learning outcomes	Master the use of proper authentication methods based on the application domain and its security requirements. Implement and use a proper access control mechanism. Distinguish between different types of malware and apply appropriate methods of protection against them. Understand the causes and consequences of a buffer overflow attack and the various ways to prevent, detect, and mitigate the effects of this attack on the system.

Discipline description	
Code of discipline	SEC6234
Name of discipline	Introduction to Cloud Technologies
Number of credits (ECTS)	4
Course, semester	4,7
Department	CYBERSECURITY
Prerequisites	EGR6202 Information Theory

Postrequisites	Graduation project
Brief course description	The course contains basic information about the emergence, development and use of cloud computing technologies. The course examines the main models of providing cloud computing services. The solutions of the leading vendors – Microsoft, Amazon, Google - are reviewed. The main advantages and disadvantages of cloud computing models and solutions based on them are analyzed.
Expected learning outcomes	After successful completion of the subject, students should know: – Fundamentals of Cloud Computing – Examples of Microsoft cloud services – Web services in the Cloud – Virtualization technologies

Discipline description

Code of discipline	SEC6243
Name of discipline	Information recovery technologies
Number of credits (ECTS)	4
Course, semester	3,6
Department	CYBERSECURITY
Prerequisites	EGR6202 Information Theory
Postrequisites	SEC6206 Cryptographic methods of information protection
Brief course description	The course is designed to teach students the basics of information recovery, which can be useful in case of its loss, damage or destruction. As part of the course, students learn to use special tools for information recovery, including data recovery programs and utilities for detecting and eliminating errors in storage systems.
Expected learning outcomes	Develop the skills of safe information recovery Ability to use data recovery programs and utilities to detect and eliminate errors in storage systems

Discipline description

Code of discipline	SEC6244
Name of discipline	Identity and Access management
Number of credits (ECTS)	6
Course, semester	4,7
Department	CYBERSECURITY
Prerequisites	SFT6211 Organization of database management systems
Postrequisites	Graduation project
Brief course description	The course includes the study of methods and technologies for managing access to information resources of the organization. During the course, students learn to apply modern methods and technologies of identity and access management, including authentication protocols, role-based access models, two-factor authentication and attribute management.
Expected learning outcomes	Applies modern methods and technologies of identity and access management Knows authentication protocols, role-based access models, two-factor authentication and attribute management

Discipline description

Code of discipline	SEC6245
Name of discipline	Cyberdisk and cyber intelligence
Number of credits (ECTS)	4

Course, semester	4,8
Department	CYBERSECURITY
Prerequisites	SEC6201 Computer Information Protection Technologies
Postrequisites	Graduation project
Brief course description	The discipline is designed to teach students the basics of cybersecurity and countering cyber threats. As part of the course, students study modern technologies and methods of protecting information from cyber threats, including access control mechanisms, firewalls, attack detection and prevention systems, antivirus programs and others. The course includes the study of the concept of cyber risks and methods of their management, students analyze cyber risks, use tools to assess them and create risk management plans.
Expected learning outcomes	Applies modern methods and technologies to protect information from cyber threats
	Knows access control mechanisms, firewalls, attack detection and prevention systems, antivirus programs