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

APPROVED BY
Vice-rector for academic affairs,
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6B06301

(Code of Academic Program)

Computer Security

(Name of Academic Program)

CATALOGUE OF ELECTIVE DISCIPLINES

2021 entry year

2021

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 Computer Engineering and Information Security department

minutes No. ___7___ from " 15 " ___02___ 2021

Acting Head of Dep _____ M.T. Ipalakova

CED compilers _____ S.T. Amanzholova

_____ A.O. Sagymbekova

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
				3 year		
1	BD	SFT6206	Development of corporate applications on the Django framework	6	6	SFT6202 Object-Oriented programming language (Java)
2	PD	SFT6204	Python programming language	5	5	SFT6202 Object-Oriented programming language (Java)
3	PD	HRD6201	Organization and architecture of computing systems	4	5	EGR6201 Basics of the Linux operating system
4	PD	SFT6214	Protection of applications and scripts from modifications	4	5	SFT6203 Web technologies
				4 year		
5	PD	SFT6211	Protection of database management systems	7	6	SFT6205 Organization of database management systems
6	PD	SEC6212	Corporate Cyber Security	7	6	SEC6201 Computer Information Protection Technologies
7	PD	SEC6208	Practical pentesting	7	6	SEC6202 Security of operating systems
8	PD	SEC6213	Digital forensics	7	6	SEC6201 Computer Information Protection Technologies

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Discipline description	
Code of discipline	SFT6206
Name of discipline	Development of corporate applications on the Django framework
Number of credits (ECTS)	6
Course, semester	3,6
Department	CE&IS
Prerequisites	SFT6202 Object-Oriented programming language (Java)
Postrequisites	Diploma project
Brief course description	Django is a full-featured server-side web framework written in Python. The Django framework handles a large number of tasks and increased workloads. It is used to create: CRM systems, CMS, Communication platforms, room reservation services, document management platforms. The course examines the creation of modern web applications on this framework.
Expected learning outcomes	- design and build Django web applications -test Django web applications -apply built-in security framework for web application

Discipline description	
Code of discipline	SFT6204
Name of discipline	Python programming language
Number of credits (ECTS)	5
Course, semester	3,5
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.

Discipline description	
Code of discipline	HRD6201
Name of discipline	Organization and architecture of computing systems
Number of credits (ECTS)	4
Course, semester	3,5
Department	CE&IS
Prerequisites	EGR6201 Basics of the Linux operating system
Postrequisites	Diploma project
Brief course description	Computer architecture is the science and art of selecting and connecting hardware components to create a computer that meets the requirements for functionality, performance, and cost. The course introduces the basic structure of a modern programmable computer, including the basic laws underlying the evaluation of equipment performance. It covers the basics of classical and modern processor design: performance and cost issues, instruction sets, caches, physical memory,

	virtual memory, I/O superscalar, and an introduction to shared memory multiprocessors.
Expected learning outcomes	Analysis of the computer's main components structure, including CPU, ALU and control unit, memory, I/O and storage. Explain high-level program execution at instruction level Optimize cache memory performance. Apply a wide range of memory technologies, both internal and external. Create program code in C that manages the processes in the processor.

Discipline description

Code of discipline	SFT6214
Name of discipline	Protection of applications and scripts from modifications
Number of credits (ECTS)	4
Course, semester	3, 5
Department	CE&IS
Prerequisites	SFT6203 Web technologies
Postrequisites	Diploma project
Brief course description	This course includes software security theory and practice, focusing on some of the common software security risks, including buffer overflows, random number generation, and identifying potential threats and vulnerabilities early in the design cycle. It focuses on methodologies and tools for identifying and remediating security vulnerabilities, methods to prove the absence of vulnerabilities, how to prevent security vulnerabilities in new software, and basic guidelines for building secure software: how to design security-aware software from scratch and integrate analysis and managing risk throughout the software lifecycle.
Expected learning outcomes	Identify and describe the various types of widely used encryption algorithms such as DES, AES, and RSA, and their applications in real life. Master the use of proper authentication methods based on the application domain and its security requirements. Implement and use an appropriate access control mechanism. Distinguish between types of malware and apply appropriate methods of protection against them. Understand the causes and consequences of a buffer overflow attack and various ways to prevent, detect, and mitigate the effects of this attack on the system.

Discipline description

Code of discipline	SFT6211
Name of discipline	Protection of database management systems
Number of credits (ECTS)	6
Course, semester	4, 7
Department	CE&IS
Prerequisites	SFT6205 Organization of database management systems
Postrequisites	Diploma project
Brief course description	Course provides an overview of the concepts and methods of securing a database management system. Topics cover advanced SQL, transaction management language, data management language, functions and triggers, database management and monitoring, database backup and recovery, SQL injection, etc. During the course, students will solve various problems using PostgreSQL

Expected learning outcomes	- discuss various issues related to the security of the database management system; - determine the necessary methods to ensure and control the security of the database management system; - apply the acquired knowledge to ensure the security of the DBMS

Discipline description

Code of discipline	SEC6212
Name of discipline	Corporate Cyber Security
Number of credits (ECTS)	6
Course, semester	4, 7
Department	CE&IS
Prerequisites	SEC6201 Computer Information Protection Technologies
Postrequisites	Diploma project
Brief course description	This course introduces security concepts, attack techniques, and security monitoring. The course enables students to understand security concepts and begin to learn the basic security techniques used by the Security Operations Center to search for threats on the network using a variety of popular security tools for real network infrastructure.
Expected learning outcomes	Apply network monitoring tools to detect attacks on network protocols and services. Apply a variety of techniques to prevent malicious access to computer networks, hosts, and enterprise data. Explain how to investigate enterprise endpoint vulnerabilities and attacks. Identify network security warnings. Analyze enterprise intrusion data to check for possible exploits. Apply incident response models to manage network security incidents.

Discipline description

Code of discipline	SEC6208
Name of discipline	Practical pentesting
Number of credits (ECTS)	6
Course, semester	4, 7
Department	CE&IS
Prerequisites	SEC6202 Security of operating systems
Postrequisites	Diploma project
Brief course description	This course is tightly integrated with a laboratory component that introduces students to various aspects of practical exploit techniques for software and networks on Windows, Linux, and Android operating systems. The course also teaches students about various important practical attacks on OSI layers and how to eliminate them.
Expected learning outcomes	Have a basic knowledge of shell coding and exploit development. Have a working knowledge of conducting systematic penetration testing against a target Search, analyze and execute a specific exploit Have basic knowledge of finding software bugs Working knowledge of the Metasploit Framework

Discipline description

Code of discipline	SEC6213
Name of discipline	Digital forensics

Number of credits (ECTS)	6
Course, semester	4, 7
Department	CE&IS
Prerequisites	SEC6201 Computer Information Protection Technologies
Postrequisites	Diploma project
Brief course description	Purpose of the course: • Introduce the digital forensics industry, including its tools and applications. Objectives: • Explain how the use of electronic evidence has evolved. • Spread the knowledge and importance of digital forensics in everyday life. • Prepare students to be the next cyberspace researchers. • Raise awareness of digital crime, how to deal with it, collect evidence and report it.
Expected learning outcomes	Explain the requirements for workstations and data recovery software. Describe the components for building a business case for developing a forensic laboratory. Explain how to determine the best data collection method. Explain the instructions for seizing digital evidence at the scene. Describe the available digital forensics software tools.