МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ ЕКОНОМІЧНИЙ УНІВЕРСИТЕТ ІМЕНІ СЕМЕНА КУЗНЕЦЯ

"ЗАТВЕРДЖУЮ"
Проректор з навчально-методичної роботи
_____
Каріна НЕМАШКАЛО

ОСНОВИ ПРОГРАМУВАННЯ

робоча програма навчальної дисципліни

Галузь знань	***12 Інформаційні технології***
Спеціальність	***125 Кібербезпека***
Освітній рівень	***перший (бакалаврський)***
Освітня програма	***Кібербезпека***

Статус дисципліни	***обов'язкова***
Мова викладання, навчання та оцінювання	***англійська***

Завідувач кафедри
кібербезпеки
та інформаційних технологій *Ольга СТАРКОВА*

Харків
2022

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS

"APPROVED"
Vice-rector for educational and methodical work
Karina NEMASHKALO

FUNDAMENTALS OF PROGRAMMING

working program of the educational discipline

Branch of knowledge	***12 Information technologies***
Specialty	***125 Cybersecurity***
Educational level	***first (*bachelor's*)***
Educational program	***Cybersecurity***

Status disciplines	***mandatory***
Language of teaching, learning and assessment	***English***

Head of Department
cyber security and
of information technologies *Olha STARKOVA*

Kharkiv
2022

APPROVED
at the meeting of the department of *cyber security and information technologies*
Protocol No. 1 dated August 27, 2022

Developer:
Ivan Mikhieiev, Ph.D. , Associate Professor of the Department of Cyber Security and Information Technologies.

Renewal and Re-Approval Letter
work program of the academic discipline

Educational year	The date of the meeting of the department - developer of WPED	Protocol number	Signature of the head of the department

Abstract of the study disciplines

The thematic plan of the educational discipline "Fundamentals of programming" and its content by modules and topics are presented, as well as plans for lectures and laboratory classes.

The discipline "Fundamentals of programming" is a mandatory educational component of the cycle of professional training of bachelors in the specialty 125 "Cybersecurity".

Today's business conditions require cyber security specialists to make comprehensive use of the latest information technologies. The broad possibilities of computerized means in matters of gathering, processing and publishing the necessary information can significantly improve the quality of economic calculations, make the process of justifying economic decisions more effective.

The educational discipline "Fundamentals of programming" is an instrumental basis for the implementation of the analytical part of further special courses, as well as course and diploma theses.

The purpose of teaching this educational discipline is to acquire the necessary knowledge regarding the basic concepts of algorithmization and the technique of application in programming of basic algorithmic structures (organization of programs) and basic data types. At the same time, much attention is paid to practical work of students on personal computers.

The results of the study of this discipline are practical skills to form the program code for the execution of procedures and functions for solving tasks related to information protection in various areas of modern business.

Characteristics of the academic discipline

Course	**1**
Semester	**1**
Number of ECTS credits	**6**
Form final control	exam

Structural and logical scheme of studying the discipline

Prerequisites	Post-requisites
Informatics according to the school curriculum	Programming technologies
	Development and analysis of algorithms

Competencies and learning outcomes for discipline

Competences	Learning outcomes
CG5. Ability to search, process and analyze information. CS1. Ability to apply the legislative and regulatory framework, as well as state and international requirements, practices and standards in order to carry out professional activities in the field of information and/or cyber security. CS3. Ability to use software and software-hardware complexes of information protection means in information and telecommunication (automated) systems. CS4. Ability to ensure business continuity in accordance with established information and/or cyber security policies. CS5. The ability to ensure the protection of information processed in information and telecommunication (automated)	LO-9 to implement processes based on national and international standards for detection, identification, analysis and response to information and/or cyber security incidents;

systems for the purpose of implementing the established information and/or cyber security policy. CS7. The ability to implement and ensure the functioning of complex information protection systems (complexes of regulatory, legal, organizational and technical means and methods, procedures, practical techniques, etc.) CS8. Ability to carry out incident management procedures, conduct investigations, provide them with an assessment. CS9. The ability to carry out professional activities based on an implemented information and/or cyber security management system. CS11. The ability to monitor the functioning of information, information and telecommunication (automated) systems in accordance with the established information and/or cyber security policy. CS12. The ability to analyze, identify and evaluate possible threats, vulnerabilities and destabilizing factors to the information space and information resources in accordance with the established policy of information and/or cyber security	
CS 7. The ability to implement and ensure the functioning of complex information protection systems (complexes of regulatory, legal, organizational and technical means and methods, procedures, practical techniques, etc.) CS 12. The ability to analyze, identify and evaluate possible threats, vulnerabilities and destabilizing factors to the information space and information resources in accordance with the established policy of information and/or cyber security	LO-12 to develop threat and offender models;
CS 1. Ability to apply the legislative and regulatory framework, as well as state and international requirements, practices and standards in order to carry out professional activities in the field of information and/or cyber security. CS 3. Ability to use software and software-hardware complexes of information protection means in information and telecommunication (automated) systems. CS 7. The ability to implement and ensure the functioning of complex information protection systems (complexes of regulatory, legal, organizational and technical means and methods, procedures, practical techniques, etc.) CS 12. The ability to analyze, identify and evaluate possible threats, vulnerabilities and destabilizing factors to the information space and information resources in accordance with the established policy of information and/or cyber security	LO-16 to implement complex information protection systems in the automated systems (AS) of the organization (enterprise) in accordance with the requirements of regulatory and legal documents;
CG 1. Ability to apply knowledge in practical situations. CS 1. Ability to apply the legislative and regulatory framework, as well as state and international requirements, practices and standards in order to carry out professional activities in the field of information and/or cyber security.	LO-35 to solve the tasks of providing and supporting complex information protection systems, as well as countering unauthorized access to information resources

CS 3. Ability to use software and software-hardware complexes of information protection means in information and telecommunication (automated) systems. CS 4. Ability to ensure business continuity in accordance with established information and/or cyber security policies. CS 5. The ability to ensure the protection of information processed in information and telecommunication (automated) systems for the purpose of implementing the established information and/or cyber security policy. CS 7. The ability to implement and ensure the functioning of complex information protection systems (complexes of regulatory, legal, organizational and technical means and methods, procedures, practical techniques, etc.) CS 8. Ability to carry out incident management procedures, conduct investigations, provide them with an assessment. CS 9. The ability to carry out professional activities based on an implemented information and/or cyber security management system. CS 12. The ability to analyze, identify and evaluate possible threats, vulnerabilities and destabilizing factors to the information space and information resources in accordance with the established policy of information and/or cyber security	and processes in information and information-telecommunication (automated) systems in accordance with the established policy of information and/or cyber security;

Program of educational discipline

Content module 1. Programming paradigms

Topic 1. Concept of algorithm
Topic 2. Elements of algorithmic languages
Topic 3. Structural programming
Topic 4. Procedural programming. Organization of functions. Recursion
Topic 5. Input and output streams

Content module 2. Data structures and object-oriented data model

Topic 6. Data arrays
Topic 7. Indicators
Topic 8. Dynamic data structures
Topic 9. Basics of OOP

The list of laboratory classes, as well as questions and tasks for independent work is given in the table "Rating plan of educational discipline".

Teaching and learning methods

In the course of teaching the discipline, the teacher uses explanatory -illustrative (informational-receptive) and reproductive teaching methods. Problem-based lectures, presentations, conversations, individual and group mini-projects are used as teaching methods aimed at activating and stimulating the educational and cognitive activity of the applicants .

Teaching the discipline involves the involvement of explanatory and illustrative , reproductive, research methods, as well as methods of problem-based learning. Thus, during lectures, the teacher provides students with a certain amount of theoretical material on the syntax of the C++ programming language (Topic 1-9), with explanations in graphic form (presentation) and with the help of examples of program code (Topic 1-9). In laboratory work, applicants have the opportunity

to acquire practical software development skills based on a problem formulated according to the subject of the lesson (Topic 1-9). Improvement of practical skills occurs during the performance of individual tasks and independent work (Topic 1-9).

The given training methods are aimed at forming the ability of students to develop algorithms and program code according to various programming paradigms.

The procedure for evaluating learning outcomes

The system for evaluating students' formed competencies takes into account the types of classes that, according to the program of the academic discipline, include lectures and laboratory classes, as well as independent work. Assessment of students' developed competencies is carried out according to a cumulative 100-point system. Control measures include:

1) current control, which is carried out during the semester during lectures and practical classes and is evaluated by the amount of points scored (maximum amount - 60 points; minimum amount - 35 points);

2) the final/semester control, which is conducted in the form of an exam, in accordance with the schedule of the educational process, is evaluated in points (the maximum amount is 40 points, the minimum amount is 25 points).

Procedure for current assessment of students' knowledge.

Assessment of the student's knowledge during lectures and practical classes is carried out according to the following criteria:

- process data, present results by developing procedural programs;
- ability to analyze and use information resources for software development;
- the ability to develop an algorithm for solving a certain task;
- knowledge of the basics of the organization of the software development environment;
- knowledge of methodology and techniques for developing modern software solutions;
- know the features of modern programming languages and their scope of application;
- use development technologies in the environment of specialized web services ;
- knowledge of data structures, file structures and computer architecture;
- the ability to use knowledge about the development of simple programs;
- ability to use software development tools.

According to the discipline, the following methods of current normative assessment are provided: survey and oral comments of the teacher based on his results, instructions of teachers in the process of performing laboratory tasks, formation of self-assessment skills and discussion by students of completed laboratory tasks, control of independent performance of individual tasks.

All work must be done independently in order to develop a creative approach to problem solving.

Lecture classes:

During the semester

Laboratory classes:

During the semester - the maximum number of points is 60 (performance and defense of laboratory work - 60), and the minimum - 35;

Independent work: consists of the time the applicant spends on preparing for laboratory work and preparing for express surveys based on lectures and laboratory work of the discipline, points for this type of work are not allocated in the technology card.

Final control in the first semester: conducted taking into account the exam.

The examination ticket covers the discipline program and provides for the determination of the level of knowledge and the degree of mastery of competencies by students.

Each exam ticket consists of 3 practical situations (one stereotypical, one diagnostic and one heuristic task), which involve the solution of typical professional tasks of a specialist at the workplace and allow to diagnose the level of theoretical training of the student and the level of his competence in the academic discipline. The evaluation of each task of the examination ticket is as follows: the first task is 20 closed-form test tasks, its completion is evaluated by 20 points; the second task is

devoted to the development of software code according to the task, its implementation is evaluated by 10 points; the third task is to debug the software code, its execution is evaluated by 10 points.

The result of the semester exam is evaluated in points (the maximum number is 40 points, the minimum number that is counted is 25 points) and is entered in the appropriate column of the examination "Success record information".

A student should be considered certified if the sum of the points obtained as a result of the final/semester performance check is equal to or higher than 60. The minimum possible number of points for current and module control during the semester is 35 and the minimum possible number of points obtained on the exam is 25.

The final grade for the academic discipline is calculated taking into account the points obtained during the current control of the accumulation system. The total result in points for the semester is: "60 or more points - credited", "59 or less points - not credited" and is entered in the "Performance record" of the academic discipline.

The final assessment is carried out according to the scale shown in the table "Evaluation scale: national and ECTS".

Forms of assessment and distribution of points are given in the table "Rating plan of educational discipline".

Rating-plan of the educational discipline

Topic	**Forms and types of education**		**Assessment forms**	**Max score**
Topic 1	***Auditory work***			
	Lecture	Lecture *"The concept of an algorithm"*	Work on lectures	
	Laboratory session	Laboratory work #1 . *Linear computational processes*	Protection of laboratory work No. 1	5
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic 2	***Auditory work***			
	Lecture	Lecture *"Elements of algorithmic languages"*	Work on lectures	
	Laboratory session	Laboratory work #2. Branched computing processes	Protection of laboratory work No. 2	5
	Independent work			

	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic 3	***Auditory work***			
	Lecture	Lecture *"Structural Programming"*	Work on lectures	
	Laboratory session	Laboratory work #3. *Loops with precondition and postcondition*	Protection of laboratory work No. 3	5
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic 4	***Auditory work***			
	Lecture	Lecture *"Development and use of functions"*	Work on lectures	
	Laboratory session	Laboratory work 4. *Cycles with a parameter*	Protection of laboratory work No. 4	5
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic 5	***Auditory work***			
	Lecture	Lecture " *Input and output streams"*	Work on lectures	
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic	***Auditory work***			
	Lecture	Lecture *"Data arrays"*	Work on lectures	
	Laboratory session	Laboratory work 5. *Processing of one-dimensional and*	Protection of laboratory work	10

6		*multidimensional arrays*	No. 5	
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic 7	***Auditory work***			
	Lecture	Lecture *"Pointers"*	Work on lectures	
	Laboratory session	Laboratory work No. 6. *Processing of arrays using pointers*	Protection of laboratory work No. 6	10
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic 8	***Auditory work***			
	Lecture	Lecture *"Dynamic data structures"*	Work on lectures	
	Laboratory session	Laboratory work #7. Implementation of dynamic data structures	Protection of laboratory work No. 7	10
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Topic 9	***Auditory work***			
	Lecture	Lecture *"Fundamentals of OOP"*	Work on lectures	
	Laboratory session	Laboratory work #8. *Working with classes and objects*	Protection of laboratory work No. 8	10
	Independent work			
	Questions and tasks for independent processing	Search, selection and review of literary sources on a given topic. Preparation for laboratory work. Performance of laboratory tasks		
Examination				40
Total number of points				100

Recommended Books

Basic

1. International Standard ISO/IEC 14882:2014(E) – Programming Language C++ , ISBN-13: 978- 0321563842: [Electronic resource]. – Access mode: https://isocpp.org/std/the-standard.
2. C/C++ language and standard libraries reference : [Electronic resource]. - Access mode: https://msdn.microsoft.com/en-us/library/hh875057.aspx.
3. Kormen , Thomas G. Introduction to algorithms: Translation from English of the third edition: [Ukrainian] = Introduction that Algorithms : Third Edition : [transl. from English] / Thomas G. Corman , Charles E. Leiterson , Ronald L. Rivest , Clifford Stein , K. : K. I. S., 2019. — 1288 p.
4. Joel Murach , Mary Delamater Murach's C++ Programming 2018 - Fresno , CA, United States : Mike Murach & Associates Inc. _ , 2018 - 770 p.

Additional

5. Aitchison I. Introduction to C++ Programming [Electronic resource] / Ian Aitchison , Peter King . – Access mode: http://www.macs.hw.ac.uk/~pjbk/pathways/cpp1/cpp1.html
6. Miller R. An Introduction that the Imperative Part of C++ [Electronic resource] / Rob Miller , William Knottenbelt . – Access mode: http://www.doc.ic.ac.uk/~wjk/C++Intro/#S1
7. Reddy S. An Introduction to C++ [Electronic resource] / Saveen Reddy , G. BowdenWise . - Access mode: http://www.acm.org/crossroads/xrds1-1/ovp.html
8. Soulie J. C++ Tutorial [Electronic resource] / Juan Soulie . – Access mode: http://www.mg55.net/xml/browser.php?block=0&xml=cplusplus.xml
9. C++ Crash Course : A Fast-Paced Introduction ./ Lospinoso Josh . ISBN 1593278885. - 2019. - 792 p.

Information resources

10. The site of personal educational systems of Khnei National University named after S. Kuznets in the discipline "Fundamentals of programming" https://pns.hneu.edu.ua/course/view.php?id=8962.