



## Syllabus Course Program



# Introduction to the specialty. Introductory practice

**Specialty**

125 Cybersecurity and information protection

**Institute**

Educational and Scientific Institute of Computer Science and Information Technology

**Educational program**

Cybersecurity

**Department**

Cybersecurity (328)

**Level of education**

Bachelor's level

**Course type**

Special (professional), Mandatory

**Semester**

1

**Language of instruction**

English

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## Lecturers and course developers

**Alla HAVRYLOVA**

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PhD, associate professor of the cyber security department of National Technical University "Kharkiv Polytechnic Institute".

The number of scientific publications: more than 30, including 2 utility model patents, 3 monographs, of which 1 is in a peer-reviewed edition included in the Scopus database, 1 is in a foreign scientific publication, 2 is in a specialized publication of Ukraine; 14 articles, of which 7 scientific articles are in Ukrainian scientific publications, 4 scientific articles are in peer-reviewed publications included in the Scopus database, 3 articles are in foreign scientific publications. Lecturer on disciplines: "Introduction to the specialty. Introductory practice", "Organizational provision of information protection" for undergraduate students

[More about the lecturer on the department's website](#)

## General information

### Summary

The educational discipline "Introduction to the specialty. Introductory practice" is a normative educational discipline. The discipline is aimed at increasing the level of students' general understanding of theoretical and practical training in basic services, mechanisms and methods of cyber security, means of data protection in global and local computer networks, cryptographic and steganographic data protection algorithms; providing knowledge about the peculiarities of the development and implementation of protection tools in the computer system, obtaining practical skills in the implementation of well-known data protection algorithms.

### Course objectives and goals

Obtaining by students the necessary knowledge about the peculiarities of becoming specialists in cyber security and information protection.

## Format of classes

Lectures, laboratory classes, consultations, self-study. Final control – credit test.

## Competencies

GC-1. Ability to apply knowledge in practical situations.

GC-2. Knowledge and understanding of the domain and understanding of the profession.

GC-4. Ability to identify, state and solve problems in a professional manner.

GC-5. Ability to search, process and analyze information.

PC-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.

PC-3. Ability to use software and software-hardware complexes of means of information protection in information and telecommunication (automated) systems.

PC-4. Ability to ensure business continuity in accordance with the established information and/or cyber security policy.

PC-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.

PC-7. Ability to implement and ensure the functioning of complex information protection systems (complexes of regulatory, organizational and technical means and methods, procedures, practical techniques, etc.).

PC-8. Ability to carry out incident management procedures, conduct investigations, provide them with an assessment.

PC-9. Ability to perform professional activities based on the implemented information and/or cyber security management system.

PC-11. Ability to monitor the processes of functioning of information, information and telecommunication (automated) systems in accordance with the established policy of information and/or cyber security.

PC-12. 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.

## Learning outcomes

LO-1. Apply knowledge of state and foreign languages in order to ensure the effectiveness of professional communication;

LO-2. Organize own professional activity, choose optimal methods and ways of solving complex specialized tasks and practical problems in professional activity, evaluate their effectiveness;

LO-3. Use the results of independent search, analysis and synthesis of information from various sources for the effective solution of specialized tasks of professional activity.

LO-4. Analyze, argue, make decisions when solving complex specialized tasks and practical problems in professional activity, which are characterized by complexity and incomplete determination of conditions, be responsible for the decisions made.

LO-5. Adapt under the conditions of frequent changes in the technologies of professional activity, to predict the final result.

LO-6. Critically understand the main theories, principles, methods and concepts in education and professional activity.

LOR-7. Act on the basis of the legislative and regulatory framework of Ukraine and the requirements of relevant standards, including international ones in the field of information and/or cyber security.

LO-8. Prepare proposals for regulatory acts on ensuring information and/or cyber security.

LO-9. Implement processes based on national and international standards for detection, identification, analysis and response to information and/or cyber security incidents.

LO-10. Perform analysis and decomposition of information and telecommunication systems.

LO-11. Perform analysis of connections between information processes on remote computer systems.

LO-12. Develop threat and intruder models.

LO-13. Analyze projects of information and telecommunication systems based on standardized technologies and data transmission protocols.

- LO-14. Solve the task of protecting programs and information processed in information and telecommunication systems by hardware and software tools and evaluate the effectiveness of the quality of the decisions made.
- LO-15. Use modern hardware and software of information and communication technologies.
- LO-16. Implement complex information security systems in the automated systems (AS) of the organization (enterprise) in accordance with the requirements of regulatory and legal documents.
- LO-17. Ensure the processes of security and functioning of information and telecommunication (automated) systems based on practices, skills and knowledge, regarding structural (structural-logical) schemes, network topology, modern architectures and models of security of electronic information resources with a reflection of relationships and information flows, processes for internal and remote components.
- LO-18. Use software and software-hardware complexes for the security of information resources.
- LO-19. Apply theories and methods of protection to ensure information security in information and telecommunication systems.
- LO-20. Ensure the functioning of special software to protect information from destructive software influences, destructive codes in information and telecommunication systems.
- LO-21. Solve tasks of provision and support (including: review, testing, accountability) of the access control system according to the stated security policy in information and telecommunication (automated) systems.
- LO-22. Solve the management procedures of identification, authentication, authorization of processes and users in information and telecommunication systems according to the established policy of information and/or cyber security.
- LO-23. Implement measures to prevent unauthorized access to information resources and processes in information and telecommunication (automated) systems.
- LO-24. Solve the problems of managing access to information resources and processes in information and telecommunication (automated) systems based on access management models (mandatory, discretionary, role-based).
- LO-25. Ensure the introduction of accountability of the access management system to electronic information resources and processes in information and telecommunication (automated) systems using event registration logs, their analysis and stated protection procedures.
- LO-26. Implement measures and ensure the implementation of processes of prevention of unauthorized access and protection of information, information and telecommunication (automated) systems based on the reference model of interaction of open systems.
- LO-27. Solve problems of data flow protection in information and telecommunication (automated) systems.
- LO-28. Analyze and evaluate the effectiveness and level of security of resources of various classes in information and telecommunication (automated) systems during tests in accordance with the established policy of information and/or cyber security.
- LO-29. Evaluate the possibility of realization of potential threats of information processed in information and telecommunication systems and the effectiveness of the use of complexes of protection means under the conditions of realization of threats of various classes.
- LO-30. Assess the possibility of unauthorized access to elements of information and telecommunication systems.
- LO-31. Apply protection theories and methods to ensure the security of elements of information and telecommunication systems.
- LO-32. Solve the tasks of managing the processes of restoring the regular functioning of information and telecommunication systems using backup procedures in accordance with the stated security policy.
- LO-33. Solve the problems of ensuring the continuity of business processes of the organization on the basis of risk management theory.
- LO-34. Participate in the development and implementation of an information security and/or cyber security strategy in accordance with the goals and objectives of the organization.
- LO-35. Solve the tasks of providing and supporting complex information security systems, as well as countering unauthorized access to information resources and processes in information and information-telecommunication (automated) systems in accordance with the stated policy of information and/or cyber security.
- LO-36. Detect dangerous signals of technical means.

LO-37. Measure the parameters of dangerous and interfering signals during the instrumental control of information security processes and determine the effectiveness of information security against leakage through technical channels in accordance with the requirements of regulatory documents of the technical information security system.

LO-38. Interpret the results of special measurements using technical means, monitoring the characteristics of information and telecommunication systems in accordance with the requirements of regulatory documents of the technical information security system.

LO-39. Carry out attestation (based on accounting and survey) of regime territories (zones), premises, etc. under the conditions of compliance with the secrecy regime, recording the results in the relevant documents.

LO-40. Interpret the results of special measurements using technical means, control of ITS characteristics in accordance with the requirements of regulatory documents of the technical information security system.

LO-41. Ensure the continuity of the event and incident logging process based on automated procedures.

LO-42. Implement processes of detection, identification, analysis and response to information and/or cyber security incidents.

LO-43. Apply national and international regulatory acts in the field of information security and/or cyber security to investigate incidents.

LO-44. Solve the problems of ensuring the continuity of the organization's business processes on the basis of risk management theory and the stated information security management system, in accordance with national and international requirements and standards.

LO-45. Apply early classes of information security and/or cyber security policies based on risk-based access control to information assets.

LO-46. Analyze and minimize the risks of information processing in information and telecommunication systems.

LO-47. Solve the problems of protection of information processed in information and telecommunication systems using modern methods and means of cryptographic protection of information.

LO-48. Implement and maintain intrusion detection systems and use cryptographic protection components to ensure the required level of information security in information and telecommunications systems.

LO-49. Ensure the proper functioning of the monitoring system of information resources and processes in information and telecommunication systems.

LO-50. Ensure the functioning of software and software-hardware complexes for detecting intrusions of various levels and classes (statistical, signature, statistical-signature).

LO-51. Maintain operational efficiency and ensure configuration of intrusion detection systems in information and telecommunication systems.

LO-52. Use tools for monitoring processes in information and telecommunication systems.

LO-53. Solve problems of software code analysis for the presence of possible threats.

LO-54. Be aware of the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine.

## **Student workload**

The total volume of the course is 90 hours (3 ECTS credits): lectures - 16 hours, laboratory classes - 16 hours, self-study - 58 hours.

## **Course prerequisites**

Informatics according to the school curriculum, Mathematics according to the school curriculum.

## **Features of the course, teaching and learning methods, and technologies**

In the course of teaching the discipline, the teacher uses explanatory-illustrative (informational-receptive) and reproductive teaching methods. Presentations, conversations, and master classes are used as teaching methods aimed at activating and stimulating the educational and cognitive activities of applicants.

# Program of the course

## Topics of the lectures

### Topic 1. Cybersecurity is a profession of the present and the future.

Initial definitions of the specialty. How to become a cybersecurity specialist. How to choose a specialization. Requirements for a cyber security specialist. How to become a cybersecurity. Specialist

### Topic 2. Institutions providing cyber protection of the state.

Cyber Security Situation Center. State Service of Special Communications and Information Protection of Ukraine. Center for antivirus protection of information of the State Special Communications of Ukraine. Regulations on the organization of cyber protection by spheres of activity of Ukraine. CERT-UA. Regulatory and legal framework. Determining the state of cyberspace security

### Topic 3. Directions of information protection.

Methodological foundations of cyber security. Legal provision of information security. Organizational direction of information protection. Technical (hardware) measures and means of information protection. Physical methods and means of protection. Software and technical (software and hardware) protection measures/

### Topic 4. Security threats of information systems.

Classification of threats. Information security threats model. Model of the offender. Possible ways to counter threats.

### Topic 5. Computer crimes.

Classification of computer crimes. Computer criminals. Objects of computer crimes. Normative base.

### Topic 6. Encryption of information.

A practical implementation of a substitution cipher. A practical implementation of a permutation cipher with a keyword. A practical implementation of a permutation cipher with a double key. A practical implementation of the Caesar cipher. A practical implementation of the Caesar cipher with a keyword. Practical implementation of the board (square) cipher of Polybius. Practical implementation of the Athenian cipher. A practical implementation of the Wigener cipher.

## Topics of the workshops

Not provided for in the curriculum.

## Topics of the laboratory classes

Topic 1. Corporate data. Comparing data using a hash.

Topic 2. Consequences of a security breach.

Topic 3. Protection of devices and networks.

Topic 4. Creating and saving reliable passwords.

Topic 5. Data service.

Topic 6. Backup data for external storage.

Topic 7. Who owns your data.

Topic 8. Privacy protection on the Internet.

Topic 9. Researching the risks of one's behavior on the Internet.

## Self-study

A student's independent work is one of the forms of organization of learning, the main form of mastering educational material in free time from classroom training. During independent work, students study lecture material, do individual homework, prepare for tests, tests and exams. Students are also recommended additional materials (videos, articles) for self-study and analysis.

## Non-formal education

Within the framework of non-formal education, according to the relevant Regulation (<http://surf.li/pxssv>), the educational component or its individual topics may be taken into account in the case of independent completion of professional courses/trainings, civic education, online education, vocational training, etc.

In particular, certain topics of this component can be taken into account in case of successful completion of the following CISCO courses:

Intr to Cyber, Getting Started with Cisco Packet Tracer

<https://www.netacad.com/catalogs/learn?category=course>

## Course materials and recommended reading

### References

1. Synergy of building cybersecurity systems: monograph / S. Yevseiev, V. Ponomarenko, O. Laptiev, O. Milov and others. – Kharkiv: PC TECHNOLOGY CENTER, 2021. – 188 p.  
<https://drive.google.com/drive/u/1/folders/1wOTN8N-GBGO06AnvjQHU1SdBl3xCaUju>
2. Models of socio-cyber-physical systems security: monograph / S. Yevseiev, Yu. Khokhlachova, S. Ostapov, O. Laptiev and others. – Kharkiv: PC TECHNOLOGY CENTER, 2023. – 168 p.  
<https://drive.google.com/drive/u/1/folders/1wOTN8N-GBGO06AnvjQHU1SdBl3xCaUju>
3. Modeling of security systems for critical infrastructure facilities: monograph / S. Yevseiev, R. Hryshchuk, K. Molodetska, M. Nazarkevych and others. – Kharkiv: PC TECHNOLOGY CENTER, 2022. – 196 p.  
<https://drive.google.com/drive/u/1/folders/1wOTN8N-GBGO06AnvjQHU1SdBl3xCaUju>
4. Information protection technologies. / S.E. Ostapov, S.P. Yevseiev, O.G. Korol. – Chernivtsi: Chernivtsi National University, 2013. – 471 p.  
<http://kist.ntu.edu.ua/textPhD/tzi.pdf>.

### Additional references

1. Havrylova A., Khokhlachova Y., Tkachov A., Voropay N., Khvostenko V. Justification of directions for improving authentication protocols in information and communication systems. Ukrainian Information Security Research Journal. 2023, Vol. 25, №. 1. P. 6-19.  
<https://jrn1.nau.edu.ua/index.php/ZI/article/view/17593>
2. Yevseiev S., Havrylova A., Milevskiy S., Sinitsyn I. and others. Development of an improved SSL/TLS protocol using post-quantum algorithms. Eastern-European Journal of Enterprise Technologies. 2023, № 3/9 (123). P. 33-48.  
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3. Alla Gavrilova, Yevseev Serhiy. Analysis of the state of security of blockchain projects on the market of Ukrainian services. Materials of the articles of the international scientific and practical conference "Intelligent systems and information technologies", Odesa, 2019. P. 62-64.
4. Gavrilova A.A. Analysis of cryptographic algorithms submitted to the third round of the NIST competition. Materials of the all-Ukrainian round table "Actual issues of ensuring the service and combat activity of the forces of the security and defense sector", Kharkiv, 2021. P. 361-365.  
<https://ice.nure.ua/ua/student-publications/2021/>
5. Yu.E. Kulya, A.A. Gavrilova. Analysis of ciphers in wireless networks. Materials of the XXI All-Ukrainian scientific and technical conference of young scientists, graduate students and students "State, achievements and prospects of information systems and technologies", Odesa, 2021. P. 40-41.  
<https://ice.nure.ua/ua/student-publications/2021/>
6. Gavrilova A.A. Determining the state of cyberspace security. Materials of articles of the International Scientific and Practical Conference "Information Technologies and Computer Modeling", Ivano-Frankivsk, 2021. P. 11-12.  
[https://www.researchgate.net/profile/Vasyl-Gorbachuk/publication/368636872\\_Modern\\_cloud\\_concepts\\_technologies\\_applications\\_services\\_and\\_platforms/links/63f14d032958d64a5cde853a/Modern-cloud-concepts-technologies-applications-services-and-platforms.pdf](https://www.researchgate.net/profile/Vasyl-Gorbachuk/publication/368636872_Modern_cloud_concepts_technologies_applications_services_and_platforms/links/63f14d032958d64a5cde853a/Modern-cloud-concepts-technologies-applications-services-and-platforms.pdf).
7. Havrylova Alla, Tkachov Andrii, Rahimova Irada Rahim Qizi. Estimating the Efficiency of Using the Modified UMAC Algorithm. 2022 IEEE 3rd KhPI Week on Advanced Technology (KhPIWeek), Kharkiv, 2022. URL: <https://ieeexplore.ieee.org/document/9916425/metrics#metrics>.

## Assessment and grading

### Criteria for assessment of student performance, and the final score structure

Points are awarded according to the following ratio:

- laboratory work: 40% of the semester grade;
- independent work: 10% of the semester grade;
- control work: 10% of the semester grade;
- credit test: 40% of the semester grade.

### Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

## Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.

Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: <http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/>

## Approval

Approved by

Date, signature

28.08.2024

Head of the department

Serhii YEVSEIEV

Date, signature

28.08.2024

Guarantor of the educational program

Serhii YEVSEIEV