NATIONAL UNIVERSITY OF CIVIL DEFENCE OF UKRAINE

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Faculty of Fire Safety \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(name of faculty/unit )

\_\_\_\_\_\_\_ department of automatic security systems and information technologies \_\_\_\_\_\_

(name of departments )

I APPROVE

Head of the faculty (structural division)

\_\_\_fire safety \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(name faculty (structural division))

\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_Andrii ROMIN \_\_\_\_\_

(signature) (First name LAST NAME)

"\_\_\_\_\_" \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2023 year

**WORKING PROGRAM OF EDUCATIONAL DISCIPLINE**

"AUTOMATIC CONTROL AND DEVICES FOR MEASURING ENVIRONMENTAL PARAMETERS "

the name of the academic discipline

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_mandatory, professional \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

compulsory general or compulsory professional or selective

according to the educational (educational-professional, educational-scientific) program \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ " Technogenetic-ecological safety " \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

the name of the educational program

preparation\_\_ for the first (bachelor) level of higher education \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

the name of the educational degree

in the field of knowledge \_18 "Production and technologies"\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

code and name of the field of knowledge

by specialty \_183 "Technologies of environmental protection" \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

code and specialty name

language of instruction \_\_\_Ukrainian \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2023 year

Work program of the educational discipline "Automatic control and instruments for measuring environmental parameters "

the name of the academic discipline

developed in accordance with educational ( educational-professional, educational-scientific) program "Technological and ecological safety " for training for the first

the name of the program the name of the educational degree

(baccalaureatelaurel) level

in the field of knowledge 18 "Production and technologies" in the specialty 183

code and name of the field of knowledge code and specialty name

"Technology environmental protection logy"

Developer(s):teacher of the department, candidate of technical sciences, associate professor Antoshkin O.A.position, scientific degree, academic title, surname and initials

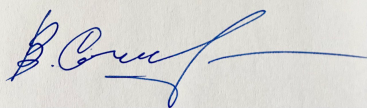
The working program of the academic discipline is recommended by the department

"Automatic security systems and information technologies"

name of the department

Minutes of "1 0 " \_\_april \_\_ 2023 No. 16

Head of the department "Automatic security systems and information technologies"

 (name of department)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Roman Shevchenko

(signature) (Own nameNAME)

"\_\_ 10 \_\_\_" \_\_\_ April \_\_\_\_\_\_ 20 23

Approved by the project team of the educational program " Technogenic and ecological safety " (name of the educational program)

Guarantor of the educational program

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Stanislav DUSHKIN \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(signature) (First name LAST NAME)

"\_\_\_\_\_" \_\_\_\_\_\_\_\_\_\_\_\_\_ 20\_\_ year

The working program of the academic discipline was approved by the academic council

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Faculty of Fire Safety \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(name of the faculty, educational unit )

Protocol dated "\_ 17 \_" \_ April \_\_\_ 2023 \_\_ year No. \_ 8 \_\_\_

Head of the faculty (educational unit) \_\_of fire safety \_\_\_\_\_\_\_\_

(name of the faculty, educational unit )

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Andrii ROMIN \_\_

(signature) (Own nameNAME)

"\_\_\_\_\_" \_\_\_\_\_\_\_\_\_\_\_\_\_ 20\_\_ year

**1. The purpose of studying the academic discipline**

**The purpose** of studying the discipline is for students of higher education to acquire theoretical knowledge and acquire practical skills necessary to solve problems related to the development, application and operation of means of automatic control and measurement of environmental parameters used in various systems for ensuring environmental safety, in including means and devices that ensure control of the safe flow of processes that affect the state of the environment, systems for early detection of emergency situations, as well as means of automatic prevention of emergency situations.

The knowledge acquired during the study of the discipline "Automatic control and instruments for measuring environmental parameters" is necessary for the applicant during the performance and protection of qualification works, as well as in professional activities when assessing the state of the environment, systems for ensuring the safety of people, enterprises and public facilities.

***Explanation:*** *for mandatory disciplines, it is worth briefly indicating the place of the educational discipline in the educational program. For electives, a brief explanation of the opportunities and benefits of studying the discipline may be given.*

As a result of studying the discipline, the student of higher education should receive:

**knowledge:**

- principles of building automatic control systems and means of early detection of emergency situations;

- basic legislative and regulatory acts on civil protection issues and requirements for automatic control systems and early detection of emergency situations;

- purpose and scope of application of technical means of control and early detection of emergency situations;

**ability/skills:**

* assess the technical condition of systems for early detection of emergency situations and systems for automatic control and management of the state of the environment;
* to check the functionality of elements of automatic systems for early detection of emergency situations and devices that ensure control of the state of the environment;
* assessment of the safety of processes and equipment and their impact on the environment;
* assessment of the state of readiness of automatic systems for monitoring environmental parameters to work in conditions of threat and emergence of emergency situations according to established criteria and indicators;
* design of environmental parameter control systems;
* drawing up functional schemes of automatic control systems of environmental parameters;
* assessment of the quality of the environmental parameter control systems.

**communication:**

* conveying information, ideas, problems, solutions, own experience and arguments to specialists and non-specialists ;
* gathering, interpretation and application of data .

**responsibility and autonomy:**

* management of complex technical or professional activities or projects ;
* the ability to bear responsibility for making and making decisions in unpredictable work and/or educational contexts ;
* the ability to continue studying systems of automatic monitoring of the state of the environment with a significant degree of autonomy, organization and management of professional development of individuals and groups.

***Explanation:*** *the formulation of knowledge, abilities, skills, etc. for mandatory disciplines should be based on a systematic and structured by competence description of qualification levels in accordance with the National Framework of Qualifications and their detailing in accordance with the solution of a certain class of tasks of professional activity and/or further study according to the educational program.*

**2. Description of the academic discipline**

|  |  |  |
| --- | --- | --- |
| Name  indicators | Form of education | |
| daytime | extramural (distance) |
| **Discipline status** *( compulsory general or mandatory professional or selective)* | mandatory  professional | mandatory  professional |
| **A year of training** | 2023-2024 | 2023-2024 |
| **Semester** | 6 | 6 |
|  |  |  |
| **Scope of discipline:** |  |  |
| - in ECTS loans | 4 | 4 |
| - the number of modules | 2 | 2 |
| - total number of hours | 120 | 120 |
|  |  |  |
| **Time allocation according to the curriculum:** | | |
| - lectures (hours) | 22 | 10 |
| - practical classes (hours) | 38 | 2 |
| - seminar classes (hours) | - | - |
| - laboratory classes (hours) | - | - |
| - course project (work) (hours) | - | - |
| - other types of classes (hours) | - | - |
| - independent work (hours) | 60 | 108 |
| - individual tasks (research) (hours) | - | - |
| - final control ( differential assessment , exam) | differential calculation | differential  test |

**3. Prerequisites for studying the discipline**

The study of the discipline is based on previously acquired knowledge from the courses "Higher Mathematics", "Physics", "Fundamentals of Information Technologies". The knowledge gained in 1-2 semesters allows you to fully master the new material.

***Explanation:*** *the prerequisites for studying a discipline are specified ( for example, a list of disciplines that must be studied earlier, a list of previously obtained learning results, etc.).*

**4. Results of training and competence in the discipline**

According to the educational program " **Technogenetic and ecological safety" ,**

name

the study of an academic discipline should ensure:

- achievement of the following learning outcomes by higher education students

|  |  |
| --- | --- |
| Program learning outcomes | PRN |
| Be able to use information technologies and communication networks for environmental protection tasks . | PR03 |
| Be able to apply the knowledge of control and assessment of the state of pollution and industrial emissions, from the analysis of the dynamics of their changes depending on the conditions and cleaning technologies  components of the environment . | PR10 |
| Be able to apply the main ones patterns of safe, resource-efficient and environmentally friendly technologies in the management of environmental protection activities, including  through environmental management systems in accordance with international standards . | PR13 |
| Disciplinary learning outcomes | *abbreviation* |
| The ability to use modern software products to ensure the process of monitoring the state of the environment. | DRN 01 |
| Knowledge of the principles of the structure and operation of devices for monitoring the state of the environment. | DRN 02 |
| Possession of the skills of the construction of circuits of automatic systems for monitoring the state of the environment. | DRN 03 |
| The ability to assess the quality of the system's operation by monitoring the state of the environment. | DRN 04 |

- formation of the following competencies in higher education students:

|  |  |
| --- | --- |
| Software competencies (general and professional) | ZK, PC |
| Ability to prevent environmental pollution and crisis phenomena and processes. | K10 |
| Ability to manage (placement and disposal) of waste. | K16 |
| Ability to ensure environmental safety. | K17 |
| Expected competencies in the discipline | *abbreviation* |
| Ability to determine functional relationships between individual elements of environmental control systems. | OKD 01 |
| Ability to make informed decisions regarding the structure and composition of environmental control systems. | OKD 02 |

***Explanation:*** *the formulation of learning outcomes for compulsory disciplines should be based on the learning outcomes defined by the relevant educational program (programmatic learning outcomes) and their detailing (disciplinary learning outcomes).*

*Competencies defined by the educational program and learning program results, for the formation of which this educational discipline is used, are given (a list of specific learning results and competences that will be formed by higher education students in the process of studying the discipline with the abbreviation of the corresponding competence, learning result in the educational program is provided). Disciplinary learning outcomes and expected competences in the discipline are also provided for compulsory and optional subjects.*

*For selective disciplines, the list of program learning outcomes and competencies is not specified.*

**5. Program of academic discipline**

**Subjects of the academic discipline:**

Module 1. Principles of construction and operation of means of measurement and control of environmental parameters .

Topic 1.1. General information about means of measurement and control of environmental parameters.

Topic 1.2. Design and operation of devices for measuring and controlling environmental parameters.

Module 2. Principles of the structure of environmental monitoring systems

Topic 2.1. Measurement errors

Topic 2.2. ACS environmental parameters

**Distribution of disciplines in hours by forms of organization of the educational process and types of educational classes:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Names of modules and topics** | **Daytime form** | | | | | |
| Number of hours | | | | | |
| everything | including | | | | |
| lectures | practical (seminar) classes | laboratory  classes (other types of classes) | independent work | modular control work |
| **6th semester** | | | | | | |
| **Module 1 . Principles of construction and operation of means of measurement and control of environmental parameters** | | | | | | |
| **Topic 1.1.**  General information about means of measurement and control of environmental parameters | 14 | 4 | - | - | 10 |  |
| **Topic 1.2.**  Design and operation of devices for measuring and controlling environmental parameters | 63 | 14 | 24 | - | 25 |  |
|  |  |  |  |  |  |  |
| **Together by module 1** | 77 | 18 | 24 | - | 35 |  |
| **6th semester** | | | | | | |
| **Module 2. Principles of the structure of environmental control systems** | | | | | | |
| **Topic 2.1.**  Measurement errors | 16 | 2 | 4 | - | 10 |  |
| **Topic 2.2.**  ACS environmental parameters | 27 | 2 | 10 | - | 15 |  |
|  |  |  |  |  |  |  |
| **Together by module 2** | 43 | 4 | 14 | - | 25 |  |
| **Together** | 120 | 22 | 38 | - | 60 |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Names of modules and topics** | **Correspondence (distance) form** | | | | | |
| Number of hours | | | | | |
| everything | including | | | | |
| lectures | practical (seminar) classes | laboratory  classes (other types of classes) | independent work | modular control work |
| **6th semester** | | | | | | |
| **Module 1. Principles of construction and operation of means of measurement and control of environmental parameters** | | | | | | |
| **Topic 1.1.**  General information about means of measurement and control of environmental parameters | 12 | 2 | - | - | 10 |  |
| **Topic 1.2.**  Design and operation of devices for measuring and controlling environmental parameters | 51 | 4 | 2 | - | 45 |  |
|  |  |  |  |  |  |  |
| **Together by module 1** | 63 | 6 | 2 | - | 55 |  |
| **6th semester** | | | | | | |
| **Module 2 . Principles of the structure of environmental control systems** | | | | | | |
| **Topic 2.1.**  Measurement errors | 20 | 2 | - | - | 18 |  |
| **Topic 2.2.**  ACS environmental parameters | 37 | 2 | - | - | 35 |  |
|  |  |  |  |  |  |  |
| **Together by module 2** | 57 | 4 | - | - | 53 |  |
| **Together** | 120 | 22 | 2 | - | 108 |  |

**Topics of seminar classes** *(if necessary)*

|  |  |  |
| --- | --- | --- |
| No  s/p | Topic name | Number  hours |
| 1. | - |  |
| ... | - |  |
|  | Together |  |

**Topics of practical classes in the afternoon (day) form** *(if necessary)*

|  |  |  |
| --- | --- | --- |
| No  s/p | Topic name | Number  hours |
|  | Design and operation of means for measuring environmental parameters . | 2 |
|  | Design and operation of pressure measuring devices. | 4 |
|  | Design and operation of means for measuring level and costs. | 4 |
|  | Design and operation of electronic devices for monitoring technological parameters. | 4 |
|  | Design and operation of means for analyzing the composition of substances. | 4 |
|  | Study of the state of the environment (SPS). | 4 |
|  | Methods of determining measurement errors. | 4 |
|  | Construction of functional automation schemes. | 4 |
|  | ACS parameters of the state monitoring process. | 2 |
|  | Automatic executive devices in environmental monitoring control systems. Design, technical characteristics and operation. | 4 |
|  | Together | 38 |

**Topics of practical classes extramural (distance) form**

|  |  |  |
| --- | --- | --- |
| No  s/p | Topic name | Number  hours |
|  | Design and operation of devices for measuring environmental parameters. | 2 |
|  | Together | 2 |

**Topics of laboratory classes** *(if necessary)*

|  |  |  |
| --- | --- | --- |
| No  s/p | Topic name | Number  hours |
| 1. | - |  |
| ... | - |  |
|  | Together |  |

**Approximate subject of individual** **tasks** *(if available)*

1. Determination of the value of various types of errors.
2. Construction of functional automation schemes.

***Explanation:*** *individual tasks include: writing abstracts, essays, performing calculation, calculation-graphic or graphic works, homework control work, translation, analytical review, analysis of practical, problem situations, preparation of the results of own research for presentation at a conference, participation in Olympiads, etc. . A special type of individual tasks is the performance of coursework (projects), which is carried out in accordance with the work curriculum and existing requirements for their content.*

**6. Evaluation tools**

The means of assessment and methods of demonstrating learning results are: differential credit at the end of the semester, individual calculation tasks in practical classes during the semester. Every student of higher education completes 2 individual written assignments during the semester.

Evaluation of training results is carried out according to the cumulative point-rating system, the main purpose of which is regular and comprehensive evaluation of the results of training activities and the formation of competencies.

***Explanation:*** *means of assessment and methods of demonstrating learning results can be: exams, comprehensive exams; offsets; standardized tests; end-to-end and team projects; analytical reports, abstracts, essays; calculation and calculation-graphic works; presentations of the results of completed tasks and research; student presentations and performances at scientific events; tasks on laboratory equipment, simulators, real objects; other types of individual and group tasks.*

**7. Evaluation criteria**

Assessment of the level of educational achievements of students in an academic discipline is carried out on a 100-point scale.

**Forms of current and final control**

Current control is carried out in the form of oral and written express surveys during practical classes during the semester, performance of individual calculation and calculation-graphic tasks.

The final control is carried out in the form of a differential assessment .

***Explanation:*** *the forms of current control are indicated, for example: frontal and individual survey, terminological dictation, performance of written tasks, practical situations, control work , etc.*

**The distribution of points received by the applicants, according to the results of mastering the academic discipline, the form of the final control of which is:**

*- differential calculation*

***Eye (day) form***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Current control and independent work | | | | | |
| Module 1 | | Module 2 | |  |  |
| T1.1 | T1.2 | T2.1 | T2.2 | Individual tasks (research) | Total points  for discipline |
| 4 | 5 6 | 9 | 23 | 8 | 100 |

***Correspondence (distance) form***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Current control and independent work | | | | | Final control (*differential calculation*) | Total points  for discipline |
| Module 1 | | Module 2 | |  |
| T1.1 | T1.2 | T2.1 | T2.2 | Individual tasks (research) |
| 11 | 37 | 1 1 | 1 1 | 5 | 25 | 100 |

***Explanation:*** *the criterion for successful completion of the final assessment by a student of higher education may be his achievement of the minimum threshold levels of grades for each planned learning outcome of the academic discipline.*

*The minimum threshold level of assessment should be determined using qualitative criteria and transformed into a minimum positive assessment of the used numerical (rating) scale.*

**8. Means of carrying out educational activities**

The material of the educational discipline is taught using samples of equipment for monitoring the state of the environment in a specialized classroom. When considering the structure of automatic control systems, the package of application programs "Dispatching control and data collection system "Aries ORM" is used.

***Explanation:*** *the names of the equipment, equipment, laboratory, specialized office, etc., as well as software, the use of which is provided by the educational discipline, are indicated.*

**9. RECOMMENDED SOURCES OF INFORMATION**

**L literature**

1. Educational and professional program "Technogenetic-ecological safety" in specialty 183 "Environmental protection technologies" training at the first (bachelor's) level of higher education in the field of knowledge 18 "Production and technologies".
2. Automation to prevent explosions and fires. O.A. Derevyanko, S.M. Bondarenko, O.A. Antoshkin, M.M. Murin, O.M. Mohylnikov - Kharkiv: АЦЗУ, 2006. - 278 p.
3. Fire and security alarm systems. Bondarenko S.M., Hristych V.V., Derevyanko O.A., Antoshkin O.A. Synopsis of lectures. Kharkiv: Ukrainian State University, 2008. - 136 p.
4. Control and measuring devices with the basics of metrology: a course of lectures / O. S. Sadovyi. - Mykolaiv: MNAU, 2016. - 84 p. URL: <http://dspace.mnau.edu.ua/jspui/bitstream/123456789/2275/1/Kontrolno-vymiryuvalni_prylady_osnovamy_metrolohiyi.pdf>
5. Heat engineering measurements and devices: teaching. manual / A. F. Kur ilov, V. M. Kozin. – Sumy: Sumy State University, 2015. – 189 p. URL: <https://core.ac.uk/download/pdf/324243027.pdf>
6. Course of lectures "Mathematical modeling and optimization of security systems" // Composers: O.A. Antoshkin, S.M. Bondarenko, O.A. Derevyanko, O.M. Lytvyak, M.M. Murin, V.V. Hristych – Kharkiv: NUCZU, 2021 <http://repositsc.nuczu.edu.ua/handle/123456789/13121>

***Explanation:*** *first, it is desirable to indicate the scientific and pedagogical worker's own achievements by discipline, then other printed materials.*

***Information resources***

1. Website of ASBIT Department URL: [http://www.asbit](http://www.asbit.nuczu.edu.ua).[nuczu.edu](http://www.asbit.nuczu.edu.ua).[ua](http://www.asbit.nuczu.edu.ua)
2. Antoshkin O.A., Lytvyak O.M, Malyarov M.V. Experimental study of the characteristics of the installation for the deposition of fire-extinguishing aerosol // Problems of fire protection. – 2020. Kharkiv, NUCDU – No. 48. - pp. 9-16. URL: <http://repositsc.nuczu.edu.ua/handle/123456789/11834>
3. Antoshkin O.A., Lytvyak O.M, Halytsa M.V. Experimental study of the influence of the electrostatic field on the deposition rate of fire-extinguishing aerosol // Problems of fire safety. – 2018. Kharkiv, NUCDU – No. 43. - pp. 9-13. URL: <http://repositsc.nuczu.edu.ua/handle/123456789/7408>

***Explanation:*** *for electronic resources, the author, the name of the material on the site, and the address on the Internet are indicated.*

**Developer(s):**

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_Oleksii ANTOSHKIN \_\_\_\_\_\_

(signature) (First name LAST NAME)