



Protection of Atmospheric Air from Particulate Pollution

Work program of the discipline (Syllabus)

Details of the discipline

Level of higher education	<i>Bachelor</i>
Field of knowledge	<i>10 Natural sciences</i>
Speciality	<i>101 Ecology</i>
Educational program	<i>Environmental safety</i>
Discipline status	<i>Custom</i>
Form of study	<i>full-time (day)/remote/mixed</i>
Year of preparation, semester	<i>2course/3 semester</i>
Scope of discipline	<i>4 credits (120 hours)</i>
Semester control/ control measures	<i>Final test</i>
Schedule of classes	<i>4 hours a week (2 hours of lectures and 1 hour of laboratory classes, 1 hour of practical)</i>
Language of instruction	<i>Ukrainian</i>
Information about thecourse / teachers	<i>Lecturer: https://eco-paper.kpi.ua/pro-kafedru/vykladachi/nosachova-yuliya-viktorivna.html Inthe compiler of practical classes: https://eco-paper.kpi.ua/pro-kafedru/vykladachi/nosachova-yuliya-viktorivna.html Inthe compilerand laboratory classes: https://eco-paper.kpi.ua/pro-kafedru/vykladachi/nosachova-yuliya-viktorivna.html https://eco-paper.kpi.ua/pro-kafedru/vykladachi/trus-inna-mikolajivna.html</i>
Course placement	<i>https://do.ipk.kpi.ua/course/view.php?id=4788</i>

The program of the discipline

Description of the discipline, its purpose, subject of study and learning outcomes

Dust and aerosols are the predominant polluting component of atmospheric air. To prevent the negative effects of human activity and improve the state of atmospheric air in terms of the presence of solid dust particles, it is necessary to constantly improve the technologies for protecting the atmosphere. load on the airspace of the planet.

The subject of the discipline "Protection of atmospheric air from pollution by dispersed particles" – one of the main directions of implementation of environmental technologies aimed at protecting the atmosphere is the purification of dust waste before its release into the atmosphere.

To a large extent, the solution of this problem will be determined by the level of training of specialists working in the field of environmental protection, including environmental safety management institutions of the state, scientific institutions and organizations, enterprises.

To successfully solve the problems of protecting and preserving the atmosphere, specialists must be fluent in information, be able to solve complex problems of protecting water bodies from pollution at a high professional level.

The purpose of the discipline "Protection of atmospheric air from pollution by dispersed particles"

The purpose of studying this discipline is to form students' complex of knowledge in the field of modern methods of gas purification, a set of skills and abilities necessary for conducting scientific research in this direction, for creating modern gas cleaning technologies and for qualified management of existing technological processes. In accordance with the goal, the preparation of bachelors requires strengthening the competencies formed by students:

- Knowledge and understanding of the theoretical foundations of ecology, environmental protection and balanced use of nature
- Ability to assess the impact of technogenesis processes on the state of the environment and identify environmental risks associated with production activities
- Ability to master international and domestic experience in solving regional and cross-border environmental problems
- Ability to develop design and working technical documentation in the field of environmental technologies, to draw up structural schemes with elements of equipment and industrial buildings, to draw up completed design and development
- Ability to improve, design, implement and operate technologies and equipment for the treatment and processing of waste gases, wastewater and solid waste
- Ability to apply modern methods and means of controlling the state of atmospheric air, natural waters, soils and biota, to determine the level of contamination of natural and industrial materials with radioactive elements, to possess methods for assessing the impact of adverse factors on living organisms, to determine the adaptive capabilities of the human body in environmental conditions
- The ability to distinguish between technological processes of production, to determine the sources and ways of entry into the environment of harmful components, to assess their impact on human health and environmental quality

According to the requirements of the program of the discipline "**Protection of atmospheric air from pollution by dispersed particles**", students after mastering it must demonstrate the following programmatic learning outcomes:

- Understand the basic concepts, theoretical and practical problems in the field of natural sciences, which are necessary for the analysis and decision-making in the field of ecology, environmental protection and optimal use of nature

- Solve problems in the field of environmental protection using generally accepted and / or standard approaches and international and domestic experience

- Be able to search for information using appropriate sources to make informed decisions

- Be able to choose the best methods and tools for conducting research, collecting and processing data

- Conduct laboratory tests using modern devices, ensure sufficient measurement accuracy and reliability of results, process the results obtained

- Apply methodologies and technologies for the design, implementation and implementation of environmental technologies and equipment, carry out design activities

- To assess the state of the environment, determine the level of impact of the enterprise (production) on the environment, determine the main environmental pollutants of this enterprise (production)

- Develop technologies, use processes and devices that ensure effective separation, concentration, extraction, destruction of harmful impurities in water systems and gas environments, recycling and disposal of waste

Prerequisites and post-requisitions of disciplines (place in the structural and logical scheme of education according to the relevant educational program)

The study of the discipline "**Protection of atmospheric air from pollution by dispersed particles**" is based on the principles of integration of various knowledge gained by students during the undergraduate period in the study of natural and engineering-technical disciplines: "Chemistry with the basics of biogeochemistry", "Special sections of biogeochemistry", "General ecology".

The discipline "**Protection of atmospheric air from pollution by dispersed particles**" is the fundamental basis for the study of the following disciplines: Acquired knowledge and skills are used in the study of the following disciplines: "Environmental Monitoring", "Modeling and Forecasting of the State of the Environment", "Rationing of anthropogenic load on the environment", "Environmental and prand generic-technogenic safety", "Technoecology" and ensures the implementation of a bachelor's project.

3. The content of the discipline "Protection of atmospheric air from pollution by dispersed particles"

Section 1. Atmospheric air of Ukraine

Topic 1. Atmosphere. Factors affecting the atmosphere.

Topic 2. Air pollution by mobile and stationary sources of road transport.

Section 2. Environmental measures and management of environmental activities.

Topic 1. Environmental measures to protect atmospheric air.

Topic 2. The system of environmental measures for the design of enterprises.

Section 3. The main directions and methods of reducing the environmental risk of air pollution.

Topic 1. Means and methods of air protection.

Methods for cleaning dust and air emissions.

Topic 2. Means of wet cleaning of gas emissions from dust

Classification of equipment for wet dust collection. Scrubbers Benturand.

Topic 3. Means for adsorption purification of gas emissions from dispersed substances.

The essence of the adsorption method of purification. Characteristics of adsorbents.

Topic 4. Aerosols – dispersed particles. Classification of aerosols, fogs, smoke.

Topic 5. Means for air purification from aerosols, oil fogs, smoke.

The essence of the methods of cleaning from aerosols, oil fogs, smoke.

Classification of devices for neutralizing aerosols, oil fogs, smoke.

Topic 6. Means of electrical and magnetic cleaning of dust emissions.

The essence of the electrical method of cleaning dust emissions. Design features of electrostatic precipitators.

Section 4. Problems and ways to improve the environmental friendliness of road transport.

Topic 1. Ways to improve the environmental safety of road transport.

Reducing air pollution by exhaust gases by saving fuel. Improvement of internal combustion engines (ICE).

Learning materials and resources

Basic literature

1. Modern technologies of atmospheric protection. Textbook for students of higher educational institutions of environmental profile /Ukl. Martynenko S.A.,- Kropyvnytskyi: CNTU, 2019.- 155 p.

2. Methods of protecting the atmosphere: lecture notes. Odesa: ODEKU, 2019. 89 p.

3. Protection of atmospheric air from contamination by dispersed particles. Laboratory workshop [Text]: textbook. posib. for students of the specialty 101 Ecology; 161 Chemical technologies and engineering / KPI them. Igor Sikorsky; compiled by: T. A. Overchenko, O. I. Ivanenko, Y. V. Nosachova, M. M. Tverdokhlib. – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2021. – 35 p.

Further reading

4. Ivanenko O.I. Methodical instructions for the implementation of course projects on the course "Technology and equipment of atmospheric protection" - K.: LLC "Infodruk", -2012. -107 p.

5. Zapolsky A.K., Salyuk A.I. Fundamentals of ecology. -K.: High School, - 2001. - 358 p.

6. Environmental technologies. Part 1. Protection of the atmosphere: textbook / Severin L.I., Petruk V.G., Bezvozyuk I.I., Vasylykivsky I.V. – Vinnitsa: VNTU, 2012. – 388 p.

7. Ratushniak G.S. Theoretical foundations of the technology of purification of gas emissions. – Vinnytsia: VSTU, 2002. – 96 p.

8. Belogurov Yu.M., Bulavin O.V., Mnuskina Yu.V. Technology of purification of gas emissions. – Donetsk: DonNTU, 2010. – 123 p.

9. Panasenko A. I. Technologist and cleaned aerosols. – Donetsk: DonNTU, 2008. -119 p.

10. Ecology and road transport: Textbook. 2nd ed., revised and supplemented / Y.F. Gutarevich, D.V. Zerkalov, A.G. Govorun, O.A. Korpach, L.P. Merzhievskaya – K.: Aristey, 2008. – 296 p.

11. Law of Ukraine on The Protection of Atmospheric Air (Bulletin of the Verkhovna Rada of Ukraine), 1992, No. 50, p.678).

12. Hygiene regulations. The maximum permissible concentrations of chemical and biological substances in the atmospheric air of populated places. <https://zakon.rada.gov.ua/laws/show/z0156-20#Text>.

13. Collection of indicators of emission (specific emissions) of pollutants into the atmospheric air by various industries. - Ukrainian Scientific Center for Technical Ecology. – Donetsk, 2004.

Information resources on the Internet

23. Ministry of Environmental Protection and Natural Resources of Ukraine - <https://mepr.gov.ua/>

24. Industrial ecology. Community of environmental specialists - <http://www.eco.com.ua/>

25. Professional Association of Ecologists of Ukraine (PAEU) - <https://paeu.com.ua/>

. Scientific and technical library. G.I. Denysenko / [Electronic resource]. – Access mode:

<https://library.kpi.ua>

26. Vernadsky National Library / [Electronic resource]. – Access mode: <http://www.nbu.gov.ua/>

27. Electronic archive of scientific and educational materials of Igor Sikorsky Kyiv Polytechnic Institute / [Electronic resource]. – Access mode: <https://ela.kpi.ua/>

5. Methods of mastering the discipline (educational component)

Lectures

Lectures are aimed at:

- providing modern, holistic, interdependent knowledge of the discipline "**Protection of atmospheric air from pollution by dispersed particles**", the level of which is determined by the target installation for each specific topic;
- ensuring in the process of the lecture the creative work of students together with the teacher;
- education of students' professional and business qualities and the development of their independent creative thinking;
- formation of students' necessary interest and determination of the direction for independent work;
- determination at the modern level of development of science in the field of modern methods and processes of gas purification, forecasting development for the coming years;
- reflection of the methodical processing of the material (selection of the main provisions, conclusions, recommendations, their clear and adequate wording)
- use for demonstration of visual materials, combining, if possible, them with a demonstration of the result and samples ;
- teaching research materials in a clear and high-quality language in compliance with structural and logical connections, explanation of all newly introduced terms and concepts;
- accessibility for perception by this audience.

No s/n	The title of the lecture topic and the list of main issues (list of didactic tools, references to literature and tasks for the ISW)	Hours
1	<p>Atmosphere. Factors affecting the atmosphere. Composition, structure, properties and functions of the atmosphere. Sources of air pollution. Literature: [1], [2], [5], [6], [13] Tasks on the ISW. Cities of Ukraine with the highest emissions of harmful substances into the atmosphere and the distribution of pollution by sources of formation.</p>	2
2.	<p>Air pollution by mobile and stationary sources of road transport. Air pollution by mobile sources of road transport. Air pollution by stationary sources of road transport. Literature: [10] Tasks on the ISW. Vibration of the car and ways to reduce it. Contamination by car wear products.</p>	4
3.	<p>Environmental measures to protect atmospheric air. Groups of environmental measures. Management of environmental activities. Organizational and legal measures to reduce air and soil pollution Literature: [11] Tasks on the ISW. Preventive measures for environmental offenses. Measures for the protection of atmospheric air in case of emergencies of anthropogenic and natural nature</p>	2
4	<p>The system of environmental measures for the design of enterprises. Environmental measures for the design of enterprises. Rationing of atmospheric air quality Literature: [1], [6], [9] Tasks on the ISW. Preventive measures for environmental offenses. Measures to protect the atmospheric air in case of emergencies of anthropogenic and natural nature</p>	2

5	<p>Means and methods of air protection.</p> <p>Methods for cleaning dust and air emissions. Cleaning in dust collectors. Cleaning in inertial dust collectors, general characteristics of cyclone structures. Literature: [1], [6], [9]</p> <p>Tasks on the ISW. The main characteristics of dust. Cyclones are presented in Ukraine and abroad.</p>	4
6	<p>Means of wet cleaning of gas emissions from dust</p> <p>Classification of equipment for wet dust collection. Ventura Scrubbers. Literature: [1], [6], [9].</p> <p>Tasks on the ISW. . Absorption by water.</p>	4
7	<p>Means for adsorption purification of gas emissions from dispersed substances.</p> <p>The essence of the adsorption method of purification. Characteristics of adsorbents. Literature: [1], [6], [9]</p> <p>Tasks on the ISW. Fundamentals of the process of adsorption and chemisorption methods. Adsorption equipment</p>	4
8	<p>Aerosols are dispersed particles.</p> <p>Classification of aerosols, fogs, smoke. Physico-chemical characteristics. Literature: [1], [6], [8], [9]</p> <p>Tasks on the ISW. Mist trapping. Directions for the recovery of captured dust</p>	4
9	<p>Means for air purification from aerosols, oil fogs, smoke.</p> <p>The essence of the methods of cleaning from aerosols, oil fogs, smoke. Classification of devices for neutralizing aerosols, oil fogs, smoke. Literature: [1], [6], [8], [9]</p> <p>Tasks on the ISW. Causes of oil fog formation. Smoke filtering.</p>	4
10	<p>Means of electrical and magnetic cleaning of dust emissions.</p> <p>The essence of the electrical method of cleaning dust emissions. Literature: [1], [6], [8], [9]</p> <p>Tasks on the ISW. Electrostatic precipitators for their use.</p>	4
11	<p>Ways to improve the environmental safety of road transport.</p> <p>Reducing air pollution by exhaust gases by saving fuel. Improvement of internal combustion engines (ICE). Literature: [10]</p> <p>Tasks on the ISW. Rationing of harmful emissions of cars and their engines</p>	2
	Just	36

Laboratory classes

In the system of professional training of students, laboratory classes occupy 2-5% of the classroom load.

No s/n	Name of laboratory work	Number of classroom hours
1	Entry. Safety briefing, familiarization with the program of laboratory work, issuance of methodological literature	1
2	Determination of the amount of dust in the air	3
3	Determination of radioactivity of dust in the air	4
4	Assessment of air pollution using lichens (lichen indexation)	3
5	Determination of dust cleaning efficiency in cyclones	4

6	Determination of the effectiveness of dust cleaning in bag filters	3
Total hours		18

Practical classes

In the system of professional training of bachelors in this discipline, practical classes occupy 2-5% of the classroom load. Being an addition to the lecture course, they lay and form the foundations of the bachelor's qualification in the field of ecology, namely the protection of the atmosphere from anthropogenic impact. allow you to check knowledge, so this type of work is an important means of operational feedback. Practical classes should perform not only cognitive and educational functions, but also contribute to the growth of bachelors as creative workers in the field of environmental protection.

The main objectives of the cycle of practical classes:

- help bachelors to systematize, consolidate and deepen knowledge of a theoretical nature in the field of fundamental methods and technologies of air purification;
- teach bachelors techniques for solving practical problems, promote mastery of skills and abilities to perform calculations, graphic and other tasks;
- teach them to work with scientific and reference literature and diagrams;
- to form the ability to learn independently, that is, to master the methods, methods and techniques of self-learning, self-development and self-control.

No s/n	The title of the topic of the practical lesson and the list of main issues (list of didactic support, references to literature and tasks to theISW)	Hours
1	Calculation of material balance. Literature: [4].	2
2	Calculation of a dry dust collector of the gravitational type according to a simplified method. Literature: [4].	2
3	Calculation of a dry gravitational dust collector according to a complicated method. Literature: [4].	2
4	Calculation of a dry centrifugal type dust collector. Literature: [4].	2
5	Calculation of the non-nozzle scrubber. Literature: [4].	2
6	Calculation of fabric bag filter. Literature: [4].	2
7	Calculation of the electrostatic precipitator. Literature: [4].	2
8	Fdm	2
9	Passed	2
	Just	18

Independent work of a student / postgraduate student

Independent work takes 40% of the time to study the credit module, including preparation for the test. The main task of independent work of students is to master scientific knowledge in areas that are not included in the list of lecture issues through personal search for information, the formation of an active interest in a creative approach in educational work. the latest technologies of air conditioning and water

purification, based on the characteristics of water and requirements for the quality of purified water. He should be able to create the most effective methods of water purification.

No s/n	The name of the topic submitted for independent study	Number of hours of ISW
<i>Section 1. Atmospheric air of Ukraine</i>		
1	<p><i>Topic 1. Sectoral structure of emissions of harmful substances into the atmosphere of Ukraine. Cities of Ukraine with the highest emissions of harmful substances into the atmosphere and the distribution of contaminants by sources of formation of the Task on the ISW. Cities of Ukraine with the highest emissions of harmful substances into the atmosphere and the distribution of pollution by sources of formation.</i></p> <p><i>[1], [6], [8], [9]</i></p> <p><i>Topic 2. Air pollution by mobile and stationary sources of road transport. Air pollution by mobile sources of road transport. Air pollution by stationary sources of road transport.</i></p> <p><i>Tasks on the ISW. Vibration of the car and ways to reduce it. Contamination by car wear products. [10]</i></p>	4
<i>Section 2. Environmental measures and management of environmental activities</i>		
2	<p><i>Topic 1. Environmental measures to protect atmospheric air. Tasks on the ISW. Preventive measures for environmental offenses. Measures for the protection of atmospheric air in case of emergencies of anthropogenic and natural nature [11, 12]</i></p> <p><i>Topic 2. The system of environmental measures for the design of enterprises. Tasks on the ISW. Preventive measures for environmental offenses. Measures for the protection of atmospheric air in the event of anthropogenic and natural emergencies [1], [6], [8], [9]</i></p>	18
<i>Section 3. The main directions and methods of reducing the environmental risk of air pollution.</i>		
3	<p><i>Topic 1. Means and methods of air protection. Methods for cleaning dust and air emissions. Cleaning in the dust depositing chamber, Cleaning in inertial dust collectors, General characteristics of cyclone structures.</i></p> <p><i>Tasks on the ISW. The main characteristics of dust. Cyclones are presented in Ukraine and abroad [1], [6], [8], [9]</i></p> <p><i>Topic 2. Means of wet cleaning of gas emissions from dust</i></p> <p><i>Classification of equipment for wet dust collection. Ventura scrubbers.</i></p> <p><i>Tasks on the ISW. . Absorption by water.</i></p> <p><i>Topic 3. Means for adsorption purification of gas emissions from dispersed substances. [1], [6], [8], [9].</i></p> <p><i>The essence of the adsorption method of purification. Characteristics of adsorbents.</i></p> <p><i>Tasks on the ISW. Fundamentals of the process of adsorption and chemisorption methods. Adsorption equipment [1], [6], [8], [9]</i></p> <p><i>Topic 4. Aerosols are dispersed particles.</i></p> <p><i>Classification of aerosols, fogs, smoke. Physico-chemical characteristics.</i></p> <p><i>Tasks on the ISW. The implementation of the capture of fogs. Directions of recovery of captured dust [8]</i></p> <p><i>Topic 5. Means for air purification from aerosols, oil fogs, smoke.</i></p> <p><i>The essence of the methods of cleaning from aerosols, oil fogs, smoke.</i></p> <p><i>Classification of devices for neutralizing aerosols, oil fogs, smoke.</i></p>	16

	<p><i>Tasks on the ISW. Causes of oil fog formation. Smoke filtering. [6]</i></p> <p><i>Topic 6. Means of electrical and magnetic cleaning of dust emissions.</i></p> <p><i>The essence of the electrical method of cleaning dust emissions. Design features of electrostatic precipitators.</i></p> <p><i>Tasks on the ISW. Electrostatic precipitators for their use. [1], [6], [8], [9]</i></p>	
<p>Section 4. Problems and ways to improve the environmental friendliness of road transport.</p>		
4	<p><i>Ways to improve the environmental safety of road transport.</i></p> <p><i>Reducing air pollution by exhaust gases by saving fuel. Improvement of internal combustion engines (ICE).</i></p> <p><i>Tasks on the ISW. Rationing of harmful emissions of cars and their engines [10, 12]</i></p>	4
	<i>Preparation for MCT</i>	2
	<i>Preparation for the test</i>	4
	<i>Total hours</i>	48

Policy and control

Policy of the discipline (educational component)

Rules for attending classes and behavior in the classroom

Students are obliged to take an active part in the educational process, not to be late for classes and not to miss them without a good reason, not to interfere with the teacher to conduct classes, not to be distracted by actions that are not related to the educational process.

Rules for assigning incentive and penalty points

- *Incentive points can be awarded by the teacher solely for performing creative work in the discipline or additional completion of online specialized courses with the receipt of the appropriate certificate:*
 - *[www.coursera.org/learn/environmental-law/Introduction to Environmental Law and Policy](http://www.coursera.org/learn/environmental-law/Introduction%20to%20Environmental%20Law%20and%20Policy)*
 - *[https://www.coursera.org/learn/air-pollution-health-threat/Air Pollution – a Global Threat to our Health](https://www.coursera.org/learn/air-pollution-health-threat/Air%20Pollution%20-%20a%20Global%20Threat%20to%20our%20Health)*

But their amount cannot exceed 10% of the rating scale.

- *penalty points in the framework of the discipline are not provided.*

Deadlines and Rescheduling Policy

In case of debts in the discipline or any force majeure circumstances, students should contact the teacher through the available (provided by the teacher) communication channels to solve problematic issues and agree on an algorithm of actions for working out.

Academic Integrity Policy

Plagiarism and other forms of dishonest work are unacceptable. Plagiarism includes the lack of links when using printed and electronic materials, quotes, opinions of other authors. Unacceptable hints and write-offs when writing tests, conducting classes; passing the test for another student; copying materials protected by the copyright system without the permission of the author of the work.

The policy and principles of academic integrity are defined in Chapter 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>

Academic Conduct and Ethics Policy

Students should be tolerant, respect the opinions of others, formulate objections in the correct form, constructively maintain feedback in the classroom.

The norms of ethical behavior of students and employees are defined in Chapter 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: <https://kpi.ua/code>

Types of control and rating system for evaluating learning outcomes (RSO)

Distribution of study time by types of classes and tasks in the discipline in accordance with the working curriculum:

Semester	Study time		Distribution of study hours				Control measures		
	Loans	acad. H.	Lecture	Practical	Lab.	ISW	Fdm	RGR	Semester control
5	4	120	36	18	18	48	1	–	Passed

The student's rating on the discipline consists of points that he receives for:

The student's rating from the credit module is calculated from 100 points, of which 52 points are the starting scale.

The starting rating (during the semester) consists of points that the student receives for:

- work in practical classes (7 lessons);
- performance of 5 laboratory works;
- performing a modular test (MCT is divided into 2 works lasting 45 minutes each);

The system of rating (weight) points and evaluation criteria

Criteria for calculating points:

Work in practical classes:

- active creative work – 2 points;
- fruitful work – 1 point;
- absence from class without good reason – -1 point.

"unsatisfactory" – the answer does not meet the requirements for "satisfactory" – 0 points.

Performing laboratory works:

- flawless work – 4 points;
- there are certain shortcomings in the preparation and / or performance of work - 3-1 points;
- absence from class without good reason – -1 point.

Tests are estimated at 9 points:

- "excellent" – complete answer (at least 90% of the necessary information) – 9 points;
- "good" – a sufficiently complete answer (at least 75% of the necessary information), or a complete answer with minor inaccuracies – 8-5 points;
- "satisfactory" – incomplete answer (at least 60% of the necessary information) and minor errors – 4-1 points;
- "unsatisfactory" – the answer does not meet the requirements for "satisfactory" – 0 points.

The rating scale of the discipline (RD) is 100 points and is formed as the sum of all rating points received by the student based on the results of current and semester control : $R = 2 \times 7 + 4 \times 5 + 9 \times 2 + 48 = 100$ points

The condition for the first certification is to receive at least 8 points. The condition for the second certification is to receive at least 22 points.

The condition for admission to the test is the enrollment of at least one test paper and 5 laboratory works with a starting rating of at least 25 points.

At the test, students perform a written test, consisting of 48 test questions.

The sum of starting points and points for the test work is transferred to the test score according to the table:

<i>Points: practical classes +LR + MCT + test work</i>	<i>Score</i>
<i>100... 95</i>	<i>Perfectly</i>
<i>94... 85</i>	<i>Very good</i>
<i>84... 75</i>	<i>Well</i>
<i>74... 65</i>	<i>Satisfactory</i>
<i>64... 60</i>	<i>Enough</i>
<i>Less than 60</i>	<i>Disappointing</i>
<i>Failed modular tests or LR credited or starting rating less than 25 points</i>	<i>Not allowed</i>

Additional information on the discipline (educational component)

An approximate list of questions that are submitted to the MCT

1. Give a description of the structure of the atmosphere.
2. List the main functions of the atmosphere.
3. Describe the main sources of air pollution.
4. Bring the parameters of air pollution from moving vehicles.
5. Give a description of the exhaust gases.
6. Explain the specifics of moving sources of pollution (cars).
7. Give a description of environmental pollution by stationary sources.
8. Bring a management system for environmental activities.
9. Describe conservation groups.
10. List the principles of environmental management.
11. Cite the functions of environmental management.
12. Give a description of the main atmospheric pollutants.
13. Lead ways to transform pollutants in the atmosphere.
14. List the principles of environmental measures in the design of enterprises.
15. Give a definition of MPC of pollutants in the air working area.
16. To cite the stages of calculation of the GDV.
17. Describe the action of what forces the deposition of suspended particles in dry dust collectors occurs.
18. Bring the advantages and disadvantages of dust collectors.
- 19 Give examples of dust depositor designs.
20. Describe the advantages and disadvantages of inertial dust collectors.
21. Give examples of designs of inertial dust collectors.
22. Bring the design features of louvered dust collectors.
23. Describe the advantages and disadvantages of cyclones.
24. Give a classification of cyclones by design.
25. Describe the cyclones common in Ukraine and foreign.
26. Explain the application and design features of common types of general-purpose cyclones.
27. Give the principle of actions and design features of direct-flow cyclones.
28. Cite cases of group cyclones being used and what are their technical characteristics.
29. Name the use of battery cyclones and what are their technical characteristics.

30. Provide a principle of actions and design features of vortex dust collectors.
31. Explain from what forces the gases are cleaned in dynamic dust collectors, what are their design features.
32. Explain the method for determining the size of the dust collector.
33. Provide a methodology for technological calculations of cyclones and the determination of their design dimensions.
34. Give a description of the adsorption purification methods.
35. Specify the basic properties and characteristics of dust.
36. Describe the purification of gases in wet electrostatic precipitators.
37. Describe the gas cleaning in wet mechanical dust collectors. Describe the centrifugal scrubber and Venturi scrubber.
38. List the basic properties of dust.
39. Explain, how to determine the effectiveness of the capture.
40. List, how many types of mechanical dust collectors there are.
41. Name the main types of filters.
42. Explain, what is distinguished by the method of action of wet dust collectors.
43. What are the operating parameters of the nozzle dust collectors?
44. Name the main types of electrostatic precipitators.
45. Explain the principle of operation of electrostatic precipitators.
46. Explain, how to capture fogs.
47. Name the directions of recovery of captured dust.
48. Explain with what directions the internal combustion engines are being improved.
49. Give the principle of operation of the liquid neutralizer.
50. List the disadvantages of liquid neutralizers.
51. Describe the principle of operation of the filters-saber traps.
52. Give examples of alternative internal combustion engines.
53. Give a description of the new type of fuel, what is their efficiency of use.

The work program of the discipline (syllabus):

Compiled by assoc. prof. , Ph.D. Nosachova Yu.V.

Approved by Department E and TRP (Protocol No. 14 dated 8.06.2022)

Agreed by the methodical commission of the IHF (protocol No 10 dated 24.06.2022)