National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute"

Ecology and technology of plant polymers

COURSE PROJECT ON THE PROTECTION OF THE ATMOSPHERE

Work program of the discipline (Syllabus)

Details of the discipline

Level of higher education	Bachelor
Field of knowledge	10 Natural sciences
Speciality	101 Ecology
Educational program	Environmental safety
Discipline status	Mandatory
Form of study	full-time (full-time) / remote / mixed / part-time
Year of preparation, semester	2course/3 semester
Scope of discipline	1,5(45)
Semester control/ control measures	Final test
Schedule of classes	Independent work of the student
Language of instruction	Ukrainian
Information about thecourse / teachers	Lecturer: https://eco-paper.kpi.ua/pro-kafedru/vykladachi/ivanenko-olena-ivanivna.html
Course placement	https://eco-paper. kpi. ua/navchannia/sylabusy. html

The program of the discipline

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

Thepollutionof the atmosphere has recently become one of the most serious global problems. To prevent anthropogenic air pollution, it is necessary to design guaranteed highly efficient gas cleaning systems for industrial enterprises.

***The subject of the discipline "Course project for the protection of the atmosphere"** is the design of the main structures of the dust and gas system for cleaning waste gases of industrial enterprises using modern resource-efficient technologies.*

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 should be fluent in information on the directions of purification of industrial emissions, understand the processes occurring in dust and gas cleaning systems at industrial enterprises, be able to choose technologies for cleaning gas emissions, taking into account current trends and scientific developments in the field of environmental protection, in mark design technological schemes, select and calculate the necessary equipment, carry out drawings at a high professional level.

The purpose of the discipline "Course project on the protection of the atmosphere"

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 the creation of modern gas cleaning technologies and for qualified management of existing technological processes.

- *The ability to conduct research at an appropriate level*
- *The ability to evaluate and ensure the quality of the work performed*
- *The ability to assess the impact of technogenesis processes on the state of the environment and to identify environmental risks associated with production activities*
- *The ability to master international and domestic experience in solving regional and cross-border environmental problems*
- *The ability to participate in the management of environmental actions and/or environmental projects*
- *The ability to develop project and working technical documentation in the field of environmental protection technologies, to compose structural schemes with elements of equipment and industrial buildings, to draw up completed design and construction developments*
- *The ability to improve, design, implement and operate technologies and equipment for treatment and processing of raw gases, wastewater and solid waste*
- *The ability to distinguish the technological processes of production, to determine the sources and ways of entering the natural environment of harmful components, to assess their impact on human health and the quality of the environment*

*According to the requirements of the program of the discipline **"Course project to protect the atmosphere"**, students after mastering it must demonstrate the following programmatic learning results:*

- *To demonstrate an understanding of the basic principles of management of environmental actions and / or environmental projects*
- *To use the management principles on which the environmental safety system is based*
- *To know the conceptual basis of monitoring and regulation of anthropogenic load on the environment*
- *To identify the factors that determine the formation of landscape and biological diversity*
- *To solve problems in the field of environmental protection using generally accepted and / or standard approaches and international and national experience*
- *To be able to use software, GIS-technologies and Internet resources for information support of environmental research*
- *To be able to predict the impact of technological processes and industries on the environment*
- *To participate in the development and implementation of projects aimed at optimal management and treatment of industrial and municipal waste*
- *To be able to explain the social, economic and political consequences of implementing environmental projects*
- *To understand the responsibility for the effectiveness and consequences of comprehensive environmental measures*
- *To be able to choose the best methods and tools for research, data collection and processing*
- *To participate in the development of projects and practical recommendations for environmental protection*
- *To apply methodologies and technologies of design and implementation of environmental technologies and equipment, to carry out design and engineering activities*
- *To carry out technological and hydraulic calculations of treatment facilities, to compile energy and material balance of devices, to perform parametric calculation of equipment, to choose standard constructions in construction, to compile master plans of industrial enterprises*

- *To assess the state of the environment, to determine the level of impact of the company (production) on the environment, to determine the main pollutants of the environment of the company (production)*
- *To develop technologies, to use processes and devices that ensure efficient separation, concentration, removal, destruction of harmful impurities in water systems and gas medium, processing and disposal of waste*

2. 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 **"Course project on the protection of the atmosphere"** 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: "General Ecology", "Special sections of biogeochemistry ", "Chemistry with the basics of biogeochemistry".*

*The discipline **"Course project on the protection of the atmosphere"** is the fundamental basis for 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 Safety", "Technoecology" and ensures the implementation of the bachelor's degree.*

3. Schedule of the course project

Semester Week	The name of the stage of work	ISW study time
1-2	Get a topic and task	0,5
3-5	Selection and study of literature	5
6-8	Selection and justification of the technological scheme of dust and gas cleaning	4
9	Description of the processes of purification of industrial emissions occurring in the selected technology	5
10-11	Calculation of material balance	6,5
12-13	Calculation of dust and gas cleaning facilities	7
14	Graphic part of the course project	8
15	Making an explanatory note	8
16	Submission of a course project for review	0,5
17-18	Course project protection	0,5

Provision of program results by components of the educational component

PLR	
To demonstrate an understanding of the basic principles of management of environmental actions and / or environmental projects	Selection and study of literature Selection and substantiation of the technological scheme of dust and gas treatment
To use the management principles on which the environmental safety system is based	Selection and study of literature
To know the conceptual basis of monitoring and regulation of anthropogenic load on the environment	Selection and substantiation of the technological scheme of dust and gas treatment
To identify the factors that determine the formation of landscape and biological diversity	Selection and substantiation of the technological scheme of dust and gas treatment
To solve problems in the field of environmental protection using generally accepted and / or	Selection and substantiation of the technological scheme of dust and gas treatment

standard approaches and international and national experience	
To be able to use software, GIS-technologies and Internet resources for information support of environmental research	*Selection and substantiation of the technological scheme of dust and gas treatment*
To be able to predict the impact of technological processes and industries on the environment	*Selection and substantiation of the technological scheme of dust and gas treatment* *Description of industrial emission cleaning processes occurring in the selected technology*
To participate in the development and implementation of projects aimed at optimal management and treatment of industrial and municipal waste	*Selection and substantiation of the technological scheme of dust and gas treatment* *Description of industrial emission cleaning processes occurring in the selected technology* *Calculation of material balance* *Calculation of dust and gas treatment facilities*
To be able to explain the social, economic and political consequences of implementing environmental projects	*Selection and substantiation of the technological scheme of dust and gas treatment* *Description of industrial emission cleaning processes occurring in the selected technology*
To understand the responsibility for the effectiveness and consequences of comprehensive environmental measures	*Selection and substantiation of the technological scheme of dust and gas treatment* *Description of industrial emission cleaning processes occurring in the selected technology*
To be able to choose the best methods and tools for research, data collection and processing	*Selection and substantiation of the technological scheme of dust and gas treatment* *Description of industrial emission cleaning processes occurring in the selected technology*
To participate in the development of projects and practical recommendations for environmental protectio	*Description of industrial emission cleaning processes occurring in the selected technology* *Calculation of material balance* *Calculation of dust and gas treatment facilities*
To apply methodologies and technologies of design and implementation of environmental technologies and equipment, to carry out design and engineering activities	*Description of industrial emission cleaning processes occurring in the selected technology* *Calculation of material balance* *Calculation of dust and gas treatment facilities*
To carry out technological and hydraulic calculations of treatment facilities, to compile energy and material balance of devices, to perform parametric calculation of equipment, to choose standard constructions in construction, to compile master plans of industrial enterprises	*Description of industrial emission cleaning processes occurring in the selected technology* *Calculation of material balance* *Calculation of dust and gas treatment facilities* *The graphic part of the course project*
To assess the state of the environment, to determine the level of impact of the company (production) on the environment, to determine the main pollutants of the environment of the company (production)	*Description of industrial emission cleaning processes occurring in the selected technology* *Calculation of material balance* *Calculation of dust and gas treatment facilities*

To develop technologies, to use processes and devices that ensure efficient separation, concentration, removal, destruction of harmful impurities in water systems and gas medium, processing and disposal of waste	*Selection and substantiation of the technological scheme of dust and gas treatment* *Description of industrial emission cleaning processes occurring in the selected technology* *Calculation of material balance* *Calculation of dust and gas treatment facilities*

4. Learning materials and resources

Basic literature

1. Beketov V. E., Yevtukhova H. P. Sources and processes of atmospheric pollution. Kharkiv: XNUMX named after O. N. Beketova, 2019. 113 p. https://core.ac.uk/download/pdf/228030186.pdf

2. Sarapina M. V. Processes and devices for dust and gas cleaning: a course of lectures. Kharkiv: NUZZU, 2018. 125 p.

3. Krusir G. V., Madani M. M., Harkovych O. L. Techniques and technologies for cleaning gas emissions. Odesa: ONAKHT-Odesa, 2017. 207 p.

4. Synopsis of lectures on the discipline "Technologies of cleaning and utilization of industrial effluents and emissions" (Part I). Compiler: M.A. Oliynyk - Kamianske: DDTU, 2016. - 56 pages.

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

Additional literature

6. Protection of atmospheric air from contamination with gaseous impurities. Laboratory practice [Text]: teaching. manual for students majoring in Ecology 101; 161 Chemical technologies and engineering / KPI named after Igor Sikorskyi; edited by: O. I. Ivanenko, T. A. Overchenko, Yu. V., Nosachova, M. M. Tverdokhlib. Bila Tserkva: - O. V. Pshonkivskyi Publishing House, 2022. – 34 p.

7. Protection of atmospheric air from contamination by dispersed particles. Laboratory practice [Text]: teaching. manual For students majoring in Ecology 101;
161 Chemical technologies and engineering / KPI named after Igor Sikorskyi; edited by: O. I. Ivanenko, T. A. Overchenko, Yu. V. Nosachova, M. M. Tverdokhlib. Bila Tserkva: - O. V. Pshonkivskyi Publishing House, 2022. – 34 p.

8. Industrial technologies and cleaning of technological and ventilation emissions: training. manual / Yu. S. Yurkevich, O. T. Wozniak, V. M. Zhelikh; MONMS of Ukraine, NU "Lviv Polytechnic".
2012. 120 p.

9. Beketov V.E. Lecture notes from the course "Applied aeroecology". Module 1 "Atmosphere. Basic terms and definitions" / Khark. national Acad. urban farm house; V. E. Beketov, G. P. Yevtukhova, Yu. L. Kovalenko. Kh.: KhNAMG, 2011. 44 p.

10. KD 52.9.4.01–09. Methodological guidelines for forecasting meteorological conditions for the formation of air pollution levels in cities of Ukraine. Kyiv: State Hydrometeorological Service, 2010. 78 p.

Information resources on the Internet

11. Ministry of Environmental Protection and Natural Resources of Ukraine / [Electronic resource]. – Access mode: https://mepr.gov.ua/

12. Professional Association of Environmentalists of Ukraine / [Electronic resource]. – Access mode: https://pae.com.ua/

13. Scientific and technical library named after G.I. Denisenko / [Electronic resource]. – Access mode: https://library.kpi.ua

14. National Library named after V.I. Vernadsky / [Electronic resource]. – Access mode: http://www.nbuv.gov.ua/

15. Electronic archive of scientific and educational materials of KPI named after Igor Sikorsky / [Electronic resource]. – Access mode: https://ela.kpi.ua/

Educational content

5. Methods of mastering the discipline (educational component)

The course project is an independent individual task of the student. The names of the topics and the initial data are specified for each student of the group when forming the final list of names and purposefully, subject to the requirements of interested enterprises and organizations. The course project consists of 6 sections, which have several subsections. Practicalmastering of the discipline is achieved both by purposeful selection of the topics of individual lessons and by organizing the process of implementing a course project. Course project is carried out on an individual task and drawn up in the form of an explanatory note and a graphic part. 1. Literary review; 2. Assessment of toxicity of contaminants; 3. Methods of analysis and control of pollution in the environment and at the production site; 4. Theoretical data on the processes implemented in the selected technology; 5. Calculation and selection of sewage treatment plants; 6. Disposal of captured contaminants; Conclusions; References; Applications. The graphic part consists of drawings depicting a technological scheme and a choice of two devices of sewage treatment plants used in the selected technological scheme.

6. Independent work of a student / postgraduate student

Independent work takes 10-0% of the time to study the discipline. The main task of independent work of students is to masterscientific knowledge in the field of designing dust and gas cleaning systems that are not included in the list of lecture questions through personal search for information, the formation of an active interest in the creation of a course project. cleaning of contaminated gases.

Policy and control

7. Policy of the discipline (educational component)

Rules for assigning incentive and penalty points

Withincentive and penalty points within the educational component 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. It is unacceptable to pass 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

8. 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. Rob.	ISW	Fdm	RGR	Semester control
3	1,5	45	-	-	-	45	-	–	Final test

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

1.Starting component r_1:

- timeliness of the schedule of work on course design - 5-3 points;

- modernity and justification of decisions made - 12-7 points;

- correctness of application of methods of analysis and calculation – 10-6 points;

- quality of registration, compliance with the requirements of regulatory documents - 6-4 points;

- quality of graphic material and compliance with the requirements of DSTU - 7-4 points.

2. Component of the protection of the course project r_2:

- degree of material possession – 10-6 points;

- completeness of the analysis of possible options – 15-9 points;

- the degree of justification of the decisions made – 20-12 points;

- ability to defend one's opinion – 15-9 points.

The system of rating (weight) points and evaluation criterion

1. Timeliness of the schedule of work on course design 5 points.

Criteria for evaluating the work of students

Mark	Completeness of work
5	The work is presented in a timely manner.
4	The work is presented with a slight delay.
3	The work is presented with a significant delay.
0	Failure to comply with this part of the CP.

2. Modernity and justification of decisions made – 12 points.

Criteria for evaluating the work of students

Mark	Completeness of work
12	Modern decisions have been made. All justifications for decisions are done correctly. The right conclusions have been drawn.
11	Modern decisions have been made. All justifications for decisions are done correctly. Somewhat incorrect conclusions have been drawn.
10	Modern decisions have been made. Justifications for decisions contain unprincipled errors. Somewhat incorrect conclusions have been drawn.
9	Modern decisions have been made. Justifications for decisions contain fundamental errors. Wrong conclusions have been drawn.
8	Non-existent decisions have been made. Justifications for decisions contain fundamental errors. Wrong conclusions have been drawn.
7	Non-existent decisions have been made. The justifications for the decisions contain very significant errors. Accordingly, incorrect conclusions have been drawn.
0	Failure to comply with this part of the CP.

3. The correctness of the application of methods of analysis and calculation – 10 points.

Criteria for evaluating the work of students

Mark	Completeness of work

10	*The work is presented in a timely manner. The correct methods of analysis are applied, all processes are described correctly, fully, with theoretical ideas. All calculations are performed correctly.*
9	*The work is presented untimely. The correct methods of analysis are applied, all processes are described correctly, fully, with theoretical ideas. All calculations are performed correctly.*
8	*The work is presented in a timely manner. The correct methods of analysis are applied, all processes are described correctly, without theoretical ideas. Some calculations are performed incorrectly.*
7	*The work is presented untimely. In the described processes there are small (not significant) shortcomings. Some calculations are performed incorrectly.*
6	*The work is presented untimely. In the described processes there are significant drawbacks. Calculations are performed incorrectly.*
0	*Failure to comply with this part of the CP*

4. Quality of registration, compliance with the requirements of regulatory documents – 6 points.

Criteria for evaluating the work of students

Mark	*Completeness of work*
6	*High quality of registration, compliance with all requirements of regulatory documents.*
5	*The average quality of registration, non-compliance with certain requirements of regulatory documents.*
4	*Low quality of registration, non-compliance with certain requirements of regulatory documents.*
0	*Failure to comply with this part of the CP.*

5. The quality of graphic material and compliance with the requirements of DSTU – 7 points.
Criteria for evaluating the work of students

Mark	*Completeness of work*
7	*High quality of graphic material, compliance with all requirements of DSTU.*
6	*High quality of graphic material, non-compliance with some requirements of DSTU.*
5	*Average quality of graphic material, non-compliance with some requirements of DSTU.*
4	*Low quality of graphic material, non-compliance with some requirements of DSTU.*
0	*Failure to comply with this part of the CP.*

6. Degree of possession of the material – 10 points.
Criteria for Evaluating Student Response

Mark	*Completeness of work*
10	*High degree of material possession (at least 90% of the necessary information).*
9	*High degree of possession of the material (at least 90% of the necessary information), but with some inaccuracies in the answers.*
8	*Average degree of material possession (at least 75% of the necessary information).*
7	*Average degree of material possession (at least 60% of the necessary information) with minor inaccuracies in the answers.*
6	*Low degree of material possession (less than 60% of the necessary information) with significant inaccuracies in the answers.*
0	*Failure to comply with this part of the CP.*

7. Completeness of the analysis of possible options – 15 points.
Criteria for Evaluating Student Response

Mark	*Completeness of work*
15-14	*Fully analyzed all possible options for the purification of gases with theoretical ideas.*

13-12	*All possible options for cleaning gases with theoretical ideas are fully analyzed, but there are some shortcomings in the answers.*
11-10	*Partially analyzed possible options for the purification of gases with theoretical ideas.*
9	*Partially analyzed possible options for the purification of gases without theoretical ideas.*
0	*Failure to comply with this part of the CP*

8. The degree of justification of the decisions made – 20 points.

Criteria for Evaluating Student Response

Mark	*Completeness of work*
20-18	*All justifications for decisions are done correctly. The right conclusions have been drawn.*
17-15	*Justifications for decisions contain unprincipled errors. Somewhat incorrect conclusions have been drawn.*
14-12	*The justifications for the decisions contain very significant errors. Accordingly, incorrect conclusions have been drawn.*
0	*Failure to comply with this part of the CP*

9. Ability to defend one's opinion – 15 points.

Criteria for Evaluating Student Response

Mark	*Completeness of work*
15-14	*Confident answer, high self-esteem of work*
13-11	*Answer with a feeling of underperformance, average self-esteem of work*
10-9	*Uncertain response, low self-esteem of work*
0	*Failure to comply with this part of the CP*

The calculation of the points of the course project is:

$$R_{KP}=5+12+10+6+7+10+15+20+15=100 \text{ points}$$

The sum of the points of the two components is transferred to the test score according to the table (on the university scale)

$R_{KP}=r_1+r_2$	*University scale*
95...100 points	*Perfectly*
85...94 points	*Very good*
75...84 points	*Well*
65...74 points	*Satisfactory*
60...64 points	*Enough*
$R_{KR}<60$ *points*	*Disappointing*
Course project not allowed to be defended	*Not allowed*

The work program of the discipline (syllabus):

Compiled by *Candidate of Technical Sciences, Associate Professor Nosachova Yu.V.*

Approved *by the department ___E and TPP___ (protocol No 14 of 08.06.2022p.)*

Approved *by the methodical commission of the IHF (protocol No _10_ of _2 4.06.2022)*