



**Environmental Economics**  
**Work program of the discipline (Syllabus)**

**Requisites of the discipline**

Level of higher education	<i>First (bachelor's)</i>
Field of expertise	<i>16 Chemical and bioengineering</i>
Speciality	<i>161 Chemical Technology and Engineering</i>
Educational program	<i>Industrial ecology and resource efficient clean technologies</i>
Discipline status	<i>Custom</i>
Form of education	<i>full-time / remote / mixed</i>
Year of preparation, semester	<i>4th year, spring semester</i>
Scope of discipline	<i>4 ECTS credits (120 hours)</i>
Semester Control/ Control Measures	<i>Passed/MKR</i>
Schedule of classes	<i>6 hours per week (4 hours of lectures and 2 hour of practical classes)</i>
Language of instruction	<i>Ukrainian</i>
Information about the course /teachers	Lector: <a href="https://eco-paper.kpi.ua/pro-kafedru/vykladachi/trus-inna-mikolajivna.html">https://eco-paper.kpi.ua/pro-kafedru/vykladachi/trus-inna-mikolajivna.html</a> Practical/Seminar: <a href="https://eco-paper.kpi.ua/pro-kafedru/vykladachi/trus-inna-mikolajivna.html">https://eco-paper.kpi.ua/pro-kafedru/vykladachi/trus-inna-mikolajivna.html</a>
Course placement	<a href="https://do.ipu.kpi.ua/course/view.php?id=2596">https://do.ipu.kpi.ua/course/view.php?id=2596</a>

**The program of the discipline**

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

*In conditions of excessive technogenic impact on the environment, greening of social and economic development becomes important for ensuring environmental safety.*

*Solving the issues of environmental pollution - water, land resources, atmospheric air, the introduction of rational use of nature, the development of European cooperation and the transition to European standards will ensure the creation of an effective economic strategy for nature management and the transition to an environmentally oriented economy.*

*The subject of the discipline "Environmental Economics" is the study of the mechanism of social relations to attract the natural resource potential to the process of expanded reproduction and environmental protection based on the achievements of scientific and technological progress and compliance with the objective laws of the development of the biosphere*

*The purpose of the discipline "Environmental Economics"*

*The purpose of studying the discipline "Environmental Economics" is to train personnel with an ecological and economic outlook, the formation of knowledge and skills in the field of management of rational use of natural resources and environmental protection, socio-economic, political and legal aspects of nature management and environmental legislation, which make it possible to determine the level of environmental pollution, calculate the amount of damage, effectively and purposefully address issues related to environmental protection and restoration.*

*In accordance with the goal, the preparation of bachelors in this specialty requires the formation of students' competencies:*

- C 15 The ability to take into account the commercial and economic context when designing chemical plants;

- C 21 The ability to use the theoretical fundamentals of ecology, environmental protection and sustainable nature management, the basic principles and components of environmental management.
- C 22 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 "**Environmental Economics**", students after mastering it must demonstrate the following program learning outcomes:

- PO 05 To develop and implement projects related to chemical production technologies and equipment, taking into account objectives, resources, existing constraints, social and economic aspects and risks.
- PO 18 To substantiate the choice of technological schemes of production on the basis of rational use of raw materials, energy, obtaining quality products, achieving high productivity while solving environmental issues, calculate material and thermal balances of processes, based on them to find costs of raw materials and energy resources.
- PO 20 To participate in the development and implementation of projects aimed at optimal management and treatment of industrial waste.
- PO 21 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 company (production).
- PO 15 To make independent decisions at a specific working place in real production conditions in the process of performing various duties.

## **2. Prerequisites and post-details of the discipline (place in the structural and logical scheme of training in the relevant educational program)**

The study of the discipline "**Environmental Economics**" is based on the principles of integration of various knowledge gained by students during the three years of undergraduate studies in the study of natural and engineering disciplines.

The discipline "**Environmental Economics**" ensures the implementation of the bachelor's project.

## **3. Contents of the course**

### **Section 1. Natural resources and economic management of their use**

Topic 1 Economy, environment and their mutual development.

Topic 2. Methods for analyzing the interaction of the economy with the environment.

Topic 3. Material flows in the ecological-socio-economic system.

Topic 4. Economic basis of environmental tax for environmental pollution.

Topic 5. Environmental tax for environmental pollution.

Topic 6. The estimated part of the environmental tax of the Tax Code of Ukraine.

Topic 7. Environmental protection and their effects on natural resources: economic analysis of benefits and costs.

### **Section 2. Concepts and practice of nature management**

Topic 8. Economic evaluation of natural resources.

Topic 9. Economic mechanism of protection and rational use of water resources.

Topic 10. Economic mechanism of protection and rational use of subsoil.

Topic 11. Economic mechanism of protection and rational use of forests, plant and animal resources.

Topic 12. Economic mechanism of protection and sustainable use of land

Topic 13. Calculation of the amount of compensation for losses caused to the state as a result of violation of environmental legislation in Ukraine.

### **Section 3. Ecologization of production**

Topic 14. Indicators and evaluation of environmental efficiency of an environmental project

Topic 15. Economic and ecological directions of development of modern environmentally safe enterprise.

Topic 16. Experience of foreign countries in the field of nature management and environmental protection.

#### 4. Training materials and resources

##### Basic literature

1. *Environmental Economics: Textbook* / I.M. Trus, M.M. Tverdokhlib, V.V. Halysh, M.D. Gomelya.– Kyiv: Kondor, 2024. – 265 p.
2. *Environmental Economics: Textbook* / V.V. Sharavara, O.I. Lyubinsky.– Kamyanyets-Podilsky: Ruta Printing House LLC, 2020. – 252 p.
3. *Environmental Economics: Textbook* / P.I.Korenyuk, S.O.Fedulova. – Dnipropetrovsk: Accent PP, 2014. – 274 p.
4. *Environmental and Natural Resources Economics: Textbook* Ed. P. T. Bubenko; Hark. National Univ. of City. Household them. A. M. Beketov. – Kh.: KNUMG, 2014. – 280 p.

##### Further reading

5. *Tax Code of Ukraine* (<https://tax.gov.ua/nk/>)
6. *Ecological economics. Methodical instructions for conducting practical classes and independent mastering of the discipline / Compiled by: Minina O.V., Shadura-Nikiporets N.T.* – Chernihiv: ChNTU, 2020. – 80 p.
7. *Economics of environment and natural resources: monograph* / Yu.V. Dzyadykevych and others. – Ternopil: Aston, 2016. – 392 p.
8. *Water Code of Ukraine*  
<https://zakon.rada.gov.ua/laws/show/213/95-%D0%B2%D1%80>
9. *Subsoil Code of Ukraine*  
<https://zakon.rada.gov.ua/laws/show/132/94-%D0%B2%D1%80#Text>

##### Information resources on the Internet

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

#### Educational content

#### 5. Methods of mastering the discipline (educational component)

##### Lecture classes

Lectures are aimed at:

- providing modern, holistic, interdependent knowledge in the discipline "Environmental Economics", the level of which is determined by the target setting for each specific topic;
- ensuring the creative work of students together with the teacher during the lecture;
- education of students' professional and business qualities and the development of their independent creative thinking;
- formation of students' necessary interest and provision of direction for independent work;
- reflection of the methodical processing of the material for its better perception (highlighting the main provisions, conclusions, recommendations, clear and adequate to their formulations);
- use for demonstration of visual materials, combination, if possible with the demonstration of results and samples;
- teaching research materials in a clear and high-quality language in compliance with structural and logical connections, clarification of all newly introduced terms and concepts;
- availability of the information provided for perception by this audience.

No salary	The title of the lecture topic and the list of main issues (list of didactic means, references to literature and tasks on the CPC)	Hours
<b>Section 1. Natural resources and economic management of their use</b>		
1	<b>Topic 1. Economy, environment and their mutual development</b> The subject and tasks of environmental economics, the place in the system of other sciences. Indicators of environmental friendliness and environmental intensity of production. References: [1] p. 8-37; [2] p. 7-15; [4] p. 8-23; [5] p. 24-30	2

	<i>Tasks on the CPC: The relationship of economics and ecology. Methods of economic regulation in the field of environmental protection. [2] p. 9-12</i>	
2	<p><b>Topic 2. Methods for analyzing the interaction of the economy with the environment</b></p> <p><i>Leontiev's macroeconomic balance method. The concept of aggregate social, intermediate and final product, quadrants of the matrix of intersectoral balance, value added, production and consuming industries.</i></p> <p><i>References: [1] p. 38-48; 3 [11-14], [4] p. 121-131.</i></p> <p><i>Tasks on the CPC: Coefficients of technological (direct) and total costs. Indirect costs, indirect cost matrix. Theory of external effects: causes of external lium, regulatory mechanism; [3] p. 11-14.</i></p>	2
3	<p><b>Topic 3. Material flows in the ecological-socio-economic system</b></p> <p><i>Minimization of waste accumulation: reduction of production volume and primary waste, increase in recycle volume.</i></p> <p><i>References: [1] p. 49-55; [4] p. 95-113.</i></p> <p><i>Objectives on the CCF: Dynamics of population growth and consumption of natural resources. 3 [11-14].</i></p>	2
4	<p><b>Topic 4. Economic bases of environmental tax for environmental pollution</b></p> <p><i>The function of the cost of environmental protection. Marginal and total cost functions. Useful for society and transfer payments for environmental pollution.</i></p> <p><i>References: [1] p. 56-64; [5] Chapter 8.</i></p> <p><i>Tasks on the CPC: The role of environmental taxation of the enterprise in solving environmental problems and types of specially protected natural areas. [3] pp. 133-136; [3] p. 81-86.</i></p>	2
5	<p><b>Topic 5. Environmental tax for environmental pollution</b></p> <p><i>The essence of the environmental tax, basic rates and their legal framework in the Tax Code of Ukraine. Relative hazard indicators and their calculation. Sources of payments. Principles and general provisions of environmental tax calculations.</i></p> <p><i>References: [1] p. 65; [5] Chapter 8.</i></p> <p><i>Tasks on the CPC: Objects and base of taxation. [4] Section 8.</i></p>	2
6	<p><b>Topic 6. Settlement part of the environmental tax of the Tax Code of Ukraine</b></p> <p><i>Calculation of air emission tax for stationary and mobile sources. Calculation of tax on discharges of substances that pollute the aquatic environment. Calculation of waste disposal tax.</i></p> <p><i>References: [1] p. 66-73; [5] Chapter 8.</i></p> <p><i>Tasks for the CPC: Calculation of the tax on the generation and storage of radioactive waste. [5] Chapter 8</i></p>	4
7	<p><b>Topic 7. Environmental projects and natural resource-oriented projects: economic analysis of benefits and costs</b></p> <p><i>Aggregate, net, maximum net, marginal benefit and marginal costs, profitability, percentage annual rate, internal rate of return. The impact of project duration. Economies of scale.</i></p> <p><i>References: [1] p. 74-80; [4] p. 142-146.</i></p> <p><i>Objectives on the CPC: On the basic criteria for evaluating the environmental and economic efficiency of projects. [4] p. 147-148.</i></p>	4
<b>Section 2. Concepts and practice of nature management</b>		
8	<p><b>Topic 8. Economic evaluation of natural resources</b></p> <p><i>The theory of depletion of natural resources. Market methods for assessing natural resources. Theoretical conditions for the emergence of dynamic limitations.</i></p> <p><i>References: [1] p. 84-102; [2] p. 16-34; [4] p. 34-63; [7] p. 170-175.</i></p> <p><i>Tasks at the CPC: Problems of the economy of mineral resources of Ukraine that are not being restored. Economy of renewable fisheries and land resources. [3] p. 14-34.</i></p>	2
9	<p><b>Topic 9. Economic mechanism of protection and rational use of water resources</b></p> <p><i>State accounting of surface, groundwater and water use. Payment for special water use, for the use of water for the needs of hydropower and water transport.</i></p>	2

	<i>References: [1] p. 103-135; [5] Chapter 9, Chapter 16; [4] p. 70-76, 87-88. Tasks on the CPC: State Water Cadastre. Distribution of payments. [8].</i>	
10	<b>Topic 10. Economic mechanism of protection and rational use of subsoil</b> <i>Accounting for mineral resources. "Instruction on the procedure for calculating and charging for the use of subsoil for the extraction of minerals".</i> <i>References: [1] p. 136-160; [5] Chapter 11.</i> <i>Tasks on the SSF: Code of Ukraine "On Subsoil", Mining Code of Ukraine. Basic and differentiated fee standards. [4], [9].</i>	2
11	<b>Topic 11. Economic mechanism of protection and rational use of land</b> <i>Land accounting and soil grading. Monetary valuation of agricultural land.</i> <i>References: [1] p. 161-174; [4] p. 76, 88;</i> <i>Tasks on the CPC: Rational land use and protection of land [5].</i>	2
12	<b>Topic 12. Economic mechanism of protection and rational use of forests, plant and animal resources</b> <i>Payment for the use of forest resources and the use of land plots of the forest fund. Economic incentives for the protection, protection, rational use and restoration of forests.</i> <i>References: [1] p. 175-190; [5] Chapter 17.</i> <i>Tasks at the CCF: The state of forest use in Ukraine. [4] Section 9.</i>	2
13	<b>Topic 13. Calculating the amount of compensation for losses caused to the state as a result of violation of environmental legislation in Ukraine</b> <i>Compensation for losses for air pollution, pollution and irrational use of water resources, littering of land resources, damage caused to forestry and fisheries, territories and objects of the nature reserve fund.</i> <i>References: [1] p. 56-57; [2] p. 43-56; [5] Section 8.</i> <i>Tasks on CPC: Compensation for damage to trees and shrubs</i>	2
<b>Section 3. Ecologization of production</b>		
14	<b>Topic 14. Indicators and evaluation of environmental efficiency of an environmental project</b> <i>Discounted indicators and their calculation.</i> <i>References: [1] p. 195-206; [7] p. 147-149.</i> <i>Tasks on the CPC: Basic principles and analysis of environmental and economic efficiency of projects [7] page. 143-144</i>	2
15	<b>Topic 15. Economic and ecological directions of development of modern environmentally safe enterprise.</b> <i>Management of greening production. The concept of environmentally friendly production. Prerequisites for environmental modernization of production.</i> <i>References: [1] p. 207-228; [2] p. 124-134, [7] pages. 94-117.</i> <i>Tasks on the CPC: Assessment of ecological and economic efficiency of resource saving. [7] p. 112-113</i>	2
16	<b>Topic 16. Experience of foreign countries in the field of nature management and environmental protection.</b> <i>Generalization of the experience of other countries in the field of environmental protection and the possibility of its use in Ukraine. Environmental management procedures, international standards of environmental management and audit. International non-governmental organizations are an instrument of multilateral cooperation in the field of environmental management. Holding international conferences to address environmental and economic issues at the international level.</i> <i>References: [1] p. 229-263; [2] p. 89-104, 110-123, 151-154, 158-173; [7] p. 30-33.</i> <i>Tasks on the CPC: The main methods and mechanisms of environmental protection are used in foreign countries. [7] p. 30-33</i>	2
	<b>Just</b>	<b>36</b>

## Practical exercises

In the system of professional training of students in this discipline, practical classes occupy 33.3% of the classroom load. Practical classes include topics that cover a wide range of issues. They allow you to better understand the lecture material, master the methodology for assessing economic losses for environmental pollution, find out the impact of certain groups of pollutants on the environment and assess the degree of environmental risks, form an idea of the formation of an effective economic strategy Nature. The content of these classes and the methods of their conduct contribute to ensuring the development of the creative activity of the individual. They develop scientific thinking and the ability to use special terminology, allow you to test knowledge, in connection with which this type of work is an important means of operational feedback.

The main objectives of the series of practical classes:

- help students systematize, consolidate and deepen knowledge of a theoretical nature;
- teach students techniques for solving practical problems, promote the mastery of skills and abilities to perform calculations and other types of tasks;
- to form the ability to learn independently, that is, to master the methods, methods and techniques of self-study, self-development and self-control.

No salary	The title of the topic of the practical lesson and the list of main issues (list of didactic support, references to literature and tasks on the CPC)	Hours
1	<p><b>Economic evaluation of natural resources</b>            Costly, effective and reproductive economic approach to the valuation of natural resources            References: 6 [26-36].            Tasks for independent work: The main tasks of state policy in the field of assessment of natural resources. The concept of secondary resources.</p>	2
2	<p><b>Economic evaluation of natural resources</b>            Economic evaluation of land resources. Evaluation of mineral deposits.            References: 6 [26-36], [5] section 9.            Tasks for independent work: Classification of natural resources by exhaustiveness</p>	2
3	<p><b>Economic evaluation of natural resources</b>            Economic evaluation of water resources. Assessment of forest resources.            References: 6 [26-36], [5] section 9.            Tasks for independent work: Economic mechanism of protection and rational use of flora and fauna</p>	2
4	<p><b>Economic damage from pollution and environmental degradation</b>            Quantitative methods for determining the amount of economic damage from environmental pollution by direct calculation, correlation and regression analysis, combined methods.            References: 6 [49-60].            Tasks for independent work: The mechanism of occurrence of damage from environmental pollution</p>	2
5	<p><b>Environmental tax for environmental pollution</b>            Calculation of environmental tax on air emissions. Calculation of the environmental tax on discharges of substances that pollute the aquatic environment. Calculation of the environmental tax on waste disposal, on the generation and storage of radioactive waste.            References: 6 [38-48], [5] section 8.            Tasks for independent work: Responsibility for violation of environmental legislation</p>	1
6	<p>Modular test paper (1 hour)</p>	1
7	<p><b>Economic and social efficiency of environmental activities</b>            Calculation of indicators of environmental friendliness, environmental intensity of production and simple ecological and economic dependencies.</p>	2

	<p><i>References: 6 [17-25].</i></p> <p><i>Tasks for independent work: Calculation of environmental intensity at the macro, meso and micro levels. Economic stimulation of rational use of natural resources and reduction of technogenic burden on the environment</i></p>	
8	<p><b><i>Simple matrix calculations in ecological and economic analysis. Decision balance SLAE.</i></b></p> <p><i>Leontiev's macroeconomic balance method for analyzing the interaction of ecological and economic systems.</i></p> <p><i>References: 2 [127-136].</i></p> <p><i>Tasks for independent work: Neumann model. Ramsey model. Solow model.</i></p>	2
9	<p><b><i>Economic efficiency from the introduction of environmental measures.</i></b></p> <p><i>Study of economic incentives to reduce environmental pollution through environmental tax, percentage rate and single rate of waste mass generation.</i></p> <p><i>References: 2 [57-59].</i></p> <p><i>Tasks for independent work: The concepts of "economic result" and "economic effect".</i></p>	2
10	<p><b><i>International cooperation in the field of environmental protection</i></b></p> <p><i>Defining the main forms of international cooperation in the field of environmental protection.</i></p> <p><i>References: 3 [151-173].</i></p> <p><i>Tasks for independent work: Natural resource constraints of socio-economic development of world civilization</i></p>	1
11	<i>Modular test paper (1 hour)</i>	1
	<b><i>Just</i></b>	<b>18</b>

***Providing program results by the components of the educational component***

<i>Program result</i>	<i>Lecture classes</i>	<i>Practical and laboratory classes, individual tasks</i>
<i>Design and implement projects relating to technologies and equipment of chemical industries, taking into account objectives, resources, existing constraints, social and economic aspects and risks</i>	<p><u>Topic 14.</u> <i>Indicators and evaluation of environmental efficiency of an environmental project</i></p> <p><u>Topic 15.</u> <i>Economic and ecological directions of development of modern environmentally safe enterprise.</i></p> <p><u>Topic 16.</u> <i>Experience of foreign countries in the field of nature management and environmental protection.</i></p>	<u>Inservice Lesson 9.</u> <i>International cooperation in the field of environmental protection</i>
<i>To substantiate the choice of technological schemes of production on the basis of rational use of raw materials, energy, obtaining quality products, achieving high productivity with simultaneous solution of environmental issues, calculate the material and thermal balances of processes, on their basis find the costs of raw materials and energy resources.</i>	<p><u>Topic 8.</u> <i>Economic evaluation of natural resources</i></p> <p><u>Topic 9.</u> <i>Economic mechanism of protection and rational use of water resources</i></p> <p><u>Topic 10.</u> <i>Economic mechanism of protection and rational use of subsoil</i></p> <p><u>Topic 11.</u> <i>Economic mechanism of protection and rational use of land</i></p> <p><u>Topic 12.</u> <i>Economic mechanism of protection and rational use of</i></p>	<u>Inservice Lesson 1.</u> <i>Economic evaluation of natural resources</i>

	<i>forests, plant and animal resources</i>	
<i>Bparticipate in the development and implementation of projects aimed at optimal management and management of industrial waste.</i>	<i>Topic 13. Calculation of the amount of compensation for losses caused to the state as a result of violation of environmental legislation in Ukraine</i>	<i>Inservice Lesson 4. Economic damage from pollution and environmental degradation Inservice Lesson 5. Environmental tax for environmental pollution</i>
<i>P 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 the enterprise (production).</i>	<i>Topic 1. Economy, environment and their mutual development Topic 2. Methods for analyzing the interaction of the economy with the environment Topic 3. Material flows in the ecological-socio-economic system Topic 4. Economic bases of environmental tax for environmental pollution Topic 5. Environmental tax for environmental pollution Topic 6. Estimated part of the environmental tax of the Tax Code of Ukraine</i>	<i>Inservice Lesson 7. Simple matrix calculations in ecological and economic analysis. Decision balance SLAE.</i>
<i>Make independent decisions at a particular place of work under real production conditions in the process of performing various duties.</i>	<i>Topic 7. Environmental about there are and about there arectas of natural resources: economic analysis of benefits and costs</i>	<i>Inservice Lesson 6. Economic and social efficiency of environmental activities Inservice Lesson 8. Economic efficiency from the introduction of environmental measures.</i>

## 6. Independent work of a student / graduate student

*Independent work takes 55% of the time studying the credit module, including preparation for writing modular tests and credit. The main task of students' independent work is to master scientific knowledge in the field of environmental protection and environmental management, which are not included in the list of lecture issues through personal search for information; systematization and repetition of the material covered; formation of active interest and creative approach to learning. In the process of independent work within the credit module "Environmental Economics", the student must learn to deeply analyze the existing issues submitted for consideration, process it and come to their own reasonable conclusions.*

<i>No salary</i>	<i>The name of the topic submitted for independent study</i>	<i>Number of hours CPC</i>
<b>Section 1. Natural resources and economic management of their use</b>		
<i>1</i>	<i>Topic 1. Economy, environment and their mutual development The relationship of economics and ecology. Methods of economic regulation in the field of environmental protection. The role and importance of environmental education. References: [7] p. 6-26.</i>	<b>3</b>



2	<b>Topic 2. Methods for analyzing the interaction of the economy with the environment</b> General understanding of models and modeling. Coefficients of technological (direct) and total costs. Indirect costs, indirect cost matrix. References: [4] p. 121.	3
3	<b>Topic 3. Material flows in the ecological-socio-economic system</b> Dynamics of population growth and consumption of natural resources. The concept of sustainable development as the basis for the functioning of society References: [7] p. 8-15.	3
4	<b>Topic 4. Economic bases of environmental tax for environmental pollution</b> Comparison of economic incentives to reduce environmental pollution through environmental tax, percentage rate and single rate of waste mass generation. References: [7] pp. 2 53-2 63.	3
5	<b>Topic 5. Environmental tax for environmental pollution</b> Objects and base of taxation. References:[4] Chapter 8.	3
6	<b>Topic 6. Settlement part of the environmental tax of the Tax Code of Ukraine</b> Calculation of tax on generation and storage of radioactive waste References: [5] Chapter 8.	3
7	<b>Topic 7. Environmental projects and natural resource-oriented projects: economic analysis of benefits and costs</b> Economic stimulation of rational use of natural resources. Minimizing the cost of eliminating pollution. Function and Lagrange multiplier. References: [7] p. 244-253.	3
<b>Section 2. Concepts and practice of nature management</b>		
8	<b>Topic 8. Economic evaluation of natural resources</b> Problems and economy of mineral resources of Ukraine that are not restored. Economy of renewable fisheries and land. References: [7] p. 191-235.	3
9	<b>Topic 9. Economic mechanism of protection and rational use of water resources</b> State Water Cadastre. Distribution of payments. Letter tour: [8].	3
10	<b>Topic 10. Economic mechanism of protection and rational use of subsoil</b> Code of Ukraine "On Subsoil". Basic and differentiated fee standards. References: [9].	3
11	<b>Topic 11. Economic mechanism of protection and rational use of forests, plant and animal resources</b> Rational land use and land protection. References: [7] p. 240-275.	3
12	<b>Topic 12. Economic mechanism of protection and rational use of forests, plant and animal resources</b> The state of forest use in Ukraine. References: [7] p. 326-346.	3
13	<b>Topic 13. Calculating the amount of compensation for losses caused to the state as a result of violation of environmental legislation in Ukraine</b> The concept of potential, possible, actual, prejudiced and liquidated damages. References: [3] pages 121-122	3
<b>Section 3. Ecologization of production</b>		
14	<b>Topic 14. Indicators and evaluation of environmental efficiency of an environmental project</b> Regional models of ecological and economic systems. References: [7] p. 139-142	3

15	<b>Topic 15. Economic and ecological directions of development of modern environmentally safe enterprise.</b> <i>The essence, goals and principles of environmental policy.</i> <i>References: [7] p. 15-24</i>	3
16	<b>Topic 16. Experience of foreign countries in the field of nature management and environmental protection.</b> <i>The main milestones of the formation of the system of international cooperation in the field of environmental protection. Measures to implement the main directions of international cooperation in the field of environmental protection</i> <i>References: [3] p. 229-233</i>	3
17	<b>OCD</b>	10
18	<b>Preparing for ICR</b>	4
19	<b>Preparation for the test</b>	4
	<b>Just</b>	66

## Policy and control

### 7. Policy of the discipline (educational component)

#### Rules for attending classes and behavior in classes

*Attendance at classes is a compulsory component of assessment. 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

- *Encouraging points can be awarded by the teacher only for performing creative works on the discipline or additional passing of online specialized courses with obtaining the appropriate certificate:*
- [https://courses.prometheus.org.ua/courses/NaUKMA/103/2015\\_T1/about](https://courses.prometheus.org.ua/courses/NaUKMA/103/2015_T1/about)

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

- *Penalty points within the discipline are not provided.*

#### Deadlines and rebuilds policy

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

#### Academic Integrity Policy

*Plagiarism and other forms of dishonest work are unacceptable. Plagiarism refers to the lack of references when using printed and electronic materials, quotes, opinions of other authors. Inadmissible hints and cheating when writing tests, conducting classes; passing an exam 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 section 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 section 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 assessing learning outcomes (RSO)

*Distribution of study time by types of classes and tasks in the discipline according to the working curriculum:*

Semester	Study time		Distribution of training hours				Control measures		
	Loans	Acad. H.	Lecture	Practical	Lab. Rob.	CPC	FDM	OCD	Semester control
8	4	120	36	18	–	66	1	1	Passed

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

*A student's credit module rating consists of points that he receives for:*

- completed works that are submitted to practical classes;*
- implementation of OCD;*
- performance of modular test work (divided into 2 tests of 45 minutes each).*

### *System of rating (weight) points and evaluation criteria*

- Performing tasks in practical classes*

*Weight score – 5. The maximum number of points in all practical classes is 5 points, 9 = 45 points. ×*

*Criteria for evaluating the report:*

<i>Quality of work and its protection</i>	<i>Points</i>
<i>The work is done completely; The student thoroughly explains all aspects of the relevant topic, draws the necessary conclusions and generalizations, and clearly answers the questions posed</i>	<i>5</i>
<i>The work has been done, but the proper analysis of the results has not been carried out; insufficiently clearly formulated conclusions; The answers to the questions are unclear or have some inaccuracies</i>	<i>4</i>
<i>The work is done, there are minor mistakes; no conclusions; No answers to individual questions</i>	<i>3</i>
<i>The main calculations in the work have been made, but there are certain inaccuracies and some errors; Some of the questions asked remained unanswered</i>	<i>2</i>
<i>The main calculations in the work have been made, but there are inaccuracies and numerous errors; All the questions asked remained unanswered</i>	<i>1</i>
<i>Work not done</i>	<i>0</i>

- Fulfillment of design tasks of the OCD*

*The maximum number of points for completing the calculation task is 15 points.*

<i>Quality of work and its protection</i>	<i>Points</i>
<i>The method and results of the calculations are correct</i>	<i>14... 15</i>
<i>Some inaccuracies and technical errors in the calculations were made</i>	<i>11 – 13</i>
<i>Inaccuracies and numerous errors in calculations</i>	<i>7 – 10</i>
<i>The calculation method is violated, only basic calculations are made, the result has significant inaccuracies</i>	<i>1 – 6</i>
<i>Task not completed</i>	<i>0</i>

- Modular test:*

*The test paper is divided into 2 tests, each of which consists of 2 questions. Depending on the completeness and content of the answer to theoretical questions, the student receives from 0 to 10 points. Thus, the maximum number of points of the test paper is 10 points 2 2 = 40 points. ××*

*Criteria for evaluating test papers:*

<i>Completeness and signs of response</i>	<i>Points</i>
<i>Full answer to the question</i>	<i>9... 10</i>

<i>A fairly complete answer with minor inaccuracies</i>	<i>7..8</i>
<i>The answer does not provide enough facts, examples and conclusions, or makes some inaccuracies</i>	<i>6... 5</i>
<i>A partial answer is given, or serious mistakes have been made</i>	<i>3... 4</i>
<i>The answer is superficial; There is no specific wording of laws and terms</i>	<i>1... 2</i>
<i>"Unsatisfactory": Answer not counted or missing</i>	<i>0</i>

*Thus, the maximum amount of points of the starting component from the credit module is:*

$$R_c = 5 \cdot 9 + 15 + 10 \cdot 2 = 100 \text{ points}$$

*According to the results of educational work for the first 7 weeks, the "ideal student" should score 2.0 points. At the first certification (8th week), the student receives "credited" if his current rating is at least 10 points.*

*According to the results of educational work for 13 weeks of study, the "ideal student" should score 90 points. At the second certification (14th week), the student receives "credited" if his current rating is at least 45 points.*

*The maximum amount of points is 100. To obtain a credit from the credit module "automatically" you need to have a rating of at least 60 points. Students who have a rating of less than 60 points at the end of the semester, as well as those who want to increase the grade in the ECTS system, perform a credit test. The task of the test consists of test questions (50 units) of different sections of the syllabus of the credit module. Each test question is estimated at 2 points.*

*The sum of points for the test paper is transferred to the credit grade according to the table.*

<i>Score</i>	<i>Score</i>
<i>95... 100</i>	<i>Perfectly</i>
<i>85... 94</i>	<i>very good</i>
<i>75...84</i>	<i>well</i>
<i>65... 74</i>	<i>Satisfactory</i>
<i>60...64</i>	<i>enough</i>
<i>RD 60&lt;</i>	<i>Disappointing</i>
<i>Not met the conditions of admission</i>	<i>not admitted</i>

## **9. Additional information on the discipline (educational component)**

***Nfishing list of questions submitted for modular control work to Section 1. Natural resources and economic management of their use***

- 1. Analyze the purpose of research on environmental economics as a science.*
- 2. What are the main tasks solved by the Environmental Economics?*
- 3. What is the subject of environmental economics research?*
- 4. What is the relationship between economics and ecology?*
- 5. What function reveals the essence of management in the field of environmental protection?*
- 6. What is the overall effect of environmental activities?*
- 7. How are environmental norms divided according to the scope of legal regulation?*
- 8. Indicate the directions in which environmental and economic damage is determined.*
- 9. Describe the methods of economic regulation in the field of environmental protection.*
- 10. What indicators characterize the environmental friendliness of production?*
- 11. Indicate indicators of environmental intensity of production.*
- 12. What is Leontiev's macroeconomic balance method used for?*
- 13. What determines the aggregate public product?*
- 14. What is the difference between intermediate and final products?*
- 15. What are the quadrants of the intersectoral balance matrix?*
- 16. How can the growth of value added affect the amount of environmental charges?*
- 17. What do the coefficients of technological (direct) costs show?*
- 18. What do the full cost ratios show?*
- 19. What indirect costs in the cost matrix are usually considered?*

20. List the indicators that determine water quality.
21. What is the difference between exhaustible and inexhaustible natural resources?
22. Suggest solutions to environmental problems in the field of atmospheric air protection.
23. Name the main tasks of management in the field of environmental protection .
24. What is meant by rational land use?
25. What relates to the components of environmental safety?
26. Give the main elements of the environmental mechanism for regulating environmental activities.
27. How are local environmental protection funds formed?
28. How is the consumption of natural resources related to the dynamics of population growth?
29. Suggest measures to minimize waste accumulation: reducing production and primary waste, increasing the volume of recycle.
30. Describe what is the cost function of environmental protection.
31. Explain what marginal and total cost functions are.
32. Describe useful for society and transfer payments for environmental pollution.
33. Explain how economic incentives are provided to reduce environmental pollution through an environmental tax.
34. How is the aggregate, net and maximum net benefit determined?
35. Name the components of marginal benefit.
36. What is the difference between marginal costs, profitability, annual interest rate and internal rate of return?
37. How does the duration of the project affect the marginal benefit?
38. Describe the function and Lagrange multiplier in minimizing pollution elimination costs.
39. Explain the essence of the environmental tax to the Tax Code of Ukraine.
40. Describe the base rates known to you and explain their legal basis in the Tax Code of Ukraine.
41. What is considered the threshold of harmfulness of substances?
42. What indicators are used to assess the level of soil pollution by chemicals?
43. When setting fees for the use and damage to natural resources, what should be taken into account?
44. Financing of environmental protection measures is carried out at what expense?
45. Explain the relationship between economics and ecology.
46. What are the negative factors in the natural resource complex?
47. Indicate what is the valuation of natural resources.
48. Characterize environmental indicators of the effectiveness of environmental measures in agriculture.
49. What approaches does the economic evaluation of natural resources have?
50. Why are natural resources one of the most important factors of production?

***Fishing list of questions submitted for modular control work to Section 2. Concepts and practice of nature management***

1. Who distributes funds for the use of natural resources received by the State Budget of Ukraine?
2. What is the fee for the use of natural resources?
3. Explain who pays for the special use of natural resources?
4. Peculiarities of calculating economic losses in the agro-industrial complex?
5. Give examples of solving environmental problems in the field of atmospheric air protection.
6. On the basis of what is the environmental expertise carried out?
7. Describe the use of water resources in industry.
8. What are the features of the use of the atmosphere as a natural resource.
9. What are the reasons for the complication of the environmental situation related to the exploitation of land resources.
10. What indicators of water consumption rationing are used in practice?
11. How much are monetary penalties for violation of norms and rules of environmental protection?
12. Specify the peculiarities of the use of water resources for the needs of hydropower.
13. Explain what baseline data is needed to calculate relative hazard indicators?
14. Describe the principles and general provisions of environmental tax calculations.
15. Describe what belongs to the objects and base of environmental taxation?
16. What weekend is needed to calculate the tax on air emissions from stationary sources?
17. What does the calculation of the tax on emissions into the air from mobile sources provide?
18. How does economies of project scale affect marginal benefits?

19. What weekends are needed to calculate the tax on discharges of substances that pollute the aquatic environment?
20. Describe the process of economic incentives to reduce environmental pollution through the percentage rate.
21. Provide basic input data for calculating waste disposal tax.
22. Explain what basic input data is used to calculate the tax on the generation and storage of radioactive waste.
23. Give the general provisions of the theory of depletion of natural resources.
24. What principles lie in market methods of valuation of natural resources?
25. Specify the basic theoretical conditions for the occurrence of dynamic constraints.
26. What are the main problems of the economy of mineral resources of Ukraine that are not renewed.
27. What is the basis of the economy of renewable fisheries and land?
28. What is the ecological and economic function of state accounting of surface, groundwater and water use?
29. Economic incentives to reduce environmental pollution through a single norm.
30. In what case is there a fee for special water use, for the use of water for the needs of hydropower and water transport?
31. What is the economic function of land accounting and soil grading?
32. What economic effect can be associated with rational land use and land protection?
33. What are the main provisions of the Law of Ukraine "On Payment for Land"?
34. What functions of management in the field of environmental protection does the Verkhovna Rada of Ukraine perform?
35. What is the competence of the Ministry of Ecology and its local authorities?
36. By legal force, what are the environmental regulations?
37. What does the monetary valuation of agricultural land consist of?
38. Explain what function does the accounting of mineral resources perform?
39. What are the main provisions of the Code of Ukraine "On Subsoil"?
40. What are the main provisions of the Mining Code of Ukraine.
41. What is considered to be basic and differentiated fee standards?
42. What is the fee for the use of forest resources and the use of land plots of the forest fund?
43. What are the economic incentives for the protection, protection, rational use and restoration of forests?
44. Who compensates for air pollution?
45. Formulate ownership rights to natural resources, land surfaces and subsoil.
46. What are the features of the accumulation of profits in the exploitation of natural resources.
47. What does the system of taxation consist of in the mineral resource sector?
48. What are the ecological and economic problems of rehabilitation of areas of intensive use of subsoil.
49. What is the costly concept of valuation of natural resources?
50. What are natural resource inventories?
51. What is the rental concept of valuation of natural resources?

***Nfishing list of questions submitted for modular control work to Section 3.***

1. Management of environmental projects.
2. Management of greening processes:
3. Prospects of environmental entrepreneurship in Ukraine
4. The main stages of ecologization of the economy on the example of developed countries
5. Specificity of foreign environmental legislation.
6. International environmental cooperation.
7. Participation of Ukraine in international cooperation in the field of environmental protection.

***Work program of the discipline (syllabus):***

***Compiled by*** Assoc., Ph.D., Trus I.M.

***Approved by the Department of E and PPT*** (protocol № 17 from 23.05.2024)

***Approved by the methodological commission of the***

***Faculty of Engineering and Chemistry*** (protocol № 11 from 28.06.2024)