National Technical University of Ukraine
«IGOR SIKORSKY
KYIV POLYTECHNIC INSTITUTE»

Department of Ecology and Plant Polymers Technology

ENVIRONMENTAL PROTECTION STRATEGIES

Syllabus

Course details

Level of higher education	*First (bachelor's)*
Field of knowledge	*For all fields*
Specialty	*For all specialties*
Educational program	*For all educational programs*
Course type	*Selective*
Study mode	*Full-time*
Year of study/Semester	*2nd year, fall or spring semester*
Course total scope and hours distribution of classroom work and self-study	*2 credits ECTS / 60 hours:* *full-time:* *classroom classes: lectures – 18 hours, practical (seminars) – 18 hours, self-study – 24 hours* *part-time:* *classroom classes: lectures – 6 hours, practical (seminars) – 2 hours, self-study – 52 hours*
Semester assessment / control measures	*Final test / Modular control work*
Class schedule	*2 classes per week (1 hour of lecture and 1 hour of practical classes)*
Language of study	*English*
Course teachers	*https://eco-paper.kpi.ua/pro-kafedru/vykladachi/vizytky.html*
Course location	

Curriculum

1. Course description, purpose, study subject and learning outcomes

Development and implementation of an innovative model of economic development of Ukraine is associated with the development of science, modern high-tech industries (information technology, electronics, etc.), advanced resource-saving technologies and technical means in industry, transport and everyday life, efficient waste-free technologies, technological solutions and cleaning equipment for industrial effluents and emissions. Therefore, in today's world versatile traning, environmental training are extremely important. Acquired knowledge will allow future specialists to take an active part in domestic and international projects related to environmental protection and development of ecological entrepreneurship, to understand and to solve optimally ecological problems of living regions, to be able to form effective communication strategies to convey ideas, problems, decisions and own experience in the field of ecology.

The subject of the discipline *"Environmental protection Strategies» is the process of identifying key strategies and concepts of social interaction with the environment, the main preventive strategies for environmental protection, the main activities of sustainable using of natural resources. The scope of competence of this area of ecology includes the definition of priority tasks of state policy in the environmental field.*

The purpose of the discipline *"Environmental Protection Strategies" is the formation of students' competencies such as:*

- *understanding the priorities of state policy in the environmental sphere;*
- *proposing of strategies for managing the environmental safety of the regions of Ukraine;*
- *providing of comprehensive assessment of threats and risks of the state of environmental security of the regions of the state;*
- *choosing of the most effective and reasonable methods of environmental safety management that lead to minimization of environmental risks;*
- *taking into account the environmental consequences at making management decisions.*

According to the requirements of the program of the discipline "Environmental Protection Strategies", after mastering it students must demonstrate the following ***learning outcomes such as****:*

knowledge of:

- *properties of the biosphere and the principles of its development;*
- *general characteristics of modern technologies and their impact on the environment;*
- *contradictions that arise between natural ecological systems and production;*
- *causes of a complex of global environmental problems in Ukraine and the world as a whole;*
- *optimal ways of solving specific global and regional environmental problems;*
- *the main provisions of modern concepts of human development and the biosphere (the concept of the noosphere, the concept of biotic regulation of the environment, the concept of coevolution of nature and society, etc.);*
- *regulatory framework of Ukraine on environmental policy;*
- *principles of formation of the ecological monitoring system;*
- *basic provisions for reducing environmental risks;*
- *basic tasks and principles of ecological expertise, ecological management and audit.*

skills:

- *orienting in the basic problems of applied ecology*
- *substantiating of decisions to reduce environmental risks;*
- *forming of algorithm for carrying out ecological expertise of objects of impact on the environment;*
- *choosing of methods for expert assessment of anthropogenic pressures on ecosystems.*

2. Prerequisites and post-requisites of the course

The studying of the discipline "Environmental Protection Strategies" is based on the principles of integration of various knowledge acquired by students in the studying of disciplines of natural sciences, humanities and engineering. The discipline "Environmental Protection Strategies" is a fundamental basis that should ensure mastering of the basics of ecology as a theoretical basis for environmental protection and further implementation of the concept of sustainable development.

3. Course content

Section 1. Priorities of state policy in the environmental sphere

Topic 1. The concept of environment and its protection

Topic 2. The main properties of the biosphere, the principles of its development and contradictions with the objects of the technosphere

Section 2. Comprehensive assessment of environmental safety at the regional, national and global levels

Topic 3. General characteristics of modern technologies and their impact on the environment

Topic 4. Sources, scale and consequences of air pollution

Topic 5. The impact of human activities on the ecological state of the hydrosphere

Topic 6. Disposal and recycling of waste

Section 3. Management in the field of environmental protection

Topic 7. Methods of decision-making in the field of environmental protection

Topic 8. Environmental monitoring

Topic 9. Environmental management and audit

Topic 10. Environmental law

Topic 11. Ecological expertise

4. Course books and supplemental resources

Basic literature

1. A Handbook of Environmental Management / Edited by *Jon C. Lovett, David G. Ockwell.* - Edward Elgar Publishing, Inc. - 2010. - 462 p.
2. Ecology of Industrial Pollution / Edited by *Lesley C. Batty, University of Birmingham, Kevin B. Hallberg, University of Wales, Bangor*. - Cambridge University Press. – 2010. – 350 p.
3. Environmental Chemistry / Edited by *Stanley E. Manahan*. – 7th ed. - Boca Raton: CRC Press LLC. – 2000. – 877 p.
4. Environmental Management / Edited by *Santosh Kumar Sarkar*. – Sciyo. – 2010. - 258 p.
5. Environmental Protection Strategies [Electronic resource] : course book for university students majoring in engineering / Igor Sikorsky Kyiv Polytechnic Institute ; authors: *T. A. Overchenko, O. I. Ivanenko, V. V. Vember, D. E. Benatov*. – Kyiv : Igor Sikorsky Kyiv Polytechnic Institute, 2023. – 132 pages. https://ela.kpi.ua/handle/123456789/54427

Additional literature

6. Ecology, Planning, and Management of Urban Forests International Perspectives / Edited by *Margaret M. Carreiro Yong-Chang Song Jianguo Wu*. - Springer. – 2008. - 457 p.
7. Environmental Problem Solving: Psychosocial Barriers to Adaptive Change / Edited by *Alan Miller*. - Springer Nature Switzerland AG. - 1999. – 239 p.
8. Sustainable Industrial Design and Waste Management: Cradle-to-cradle for Sustainable Developmen / Edited by *Salah M. El-Haggar*. - Elsevier Inc. – 2007. – 401 p.

Information resources on the Internet

9. Ministry of Ecology and Natural Resources of Ukraine - *https://menr.gov.ua/*
10. Council of European Energy Regulator - *https://www.ceer.eu/*
11. Industrial ecology. Community of environmentalists - *http://www.eco.com.ua/*
12. United States Environmental Protection Agency - *https://www.epa.gov/*
13. World Summit on Sustainable Development (WSSD) (2002), *www.un.org/jsummit/html basic_info/basicinfo.html*.

Course content

5. Study methodology

Lectures

Lectures are aimed at:

- *providing modern and holistic knowledge in the discipline "Environmental Protection Strategies", the scope of which is determined by the target setting for each specific topic;*
- *determining the current level of development of science and technology in the field of environmental protection and forecasting their development in the coming years;*
- *education of students' professional and business qualities and the development of their independent creative thinking;*
- *the use of methodological features of processing the material for better understanding and perception (highlighting the main ideas and provisions, emphasizing the conclusions, repeating them in different formulations);*
- *use of visual elements for the perception of the material: a combination of a lecture with a demonstration of audiovisual materials, diagrams, tables and models;*

- *explanation of all newly introduced terms and concepts;*
- *formation of students' necessary motivation and interest in continuing their studies within the framework of independent work.*

№	The title of the lecture topic and a list for self-study
1	***The concept of the environment and its protection*** *Subject, methods, tasks and structure of modern ecology. The tasks facing engineers in preserving the natural environment. Theoretical aspects of environmental safety. Environmental factors and their assessment as hazards of natural and man-made origin: physical, chemical and biological components.* ***Task for self-study**: The Importance of Ecology for Human Civilization.*
2	***The main properties of the biosphere, the principles of its development and contradictions with the objects of the technosphere*** *Principles of biosphere development as a dynamic system. Features of the components of the biosphere (technosphere and sociosphere). The place and responsibility of man in the biosphere. The noosphere is the latest position in the biosphere. The main provisions of modern concepts of human development and the biosphere (the concept of the noosphere, the concept of biotic regulation of the environment, the concept of coevolution of nature and society, etc.).* ***Task for self-study**: Ecosystem Laws. The biosphere as the largest ecosystem on Earth.*
3	***General characteristics of modern technologies and their impact on the environment*** *Contradictions that arise between natural ecological systems and production. Causes of a complex of global environmental problems in Ukraine and the world as a whole.* ***Task for self-study**: Features of the impact of industrial production on the environment and ways to protect it.*
4	***General characteristics of modern technologies and their impact on the environment*** *Optimal ways of solving of specific global and regional environmental problems.* ***Task for self-study**: Sources and types of lithosphere pollution. Ways of reducing anthropogenic pressure on the environment.*
5	***Sources, scale and consequences of air pollution*** *Functions of the Earth's atmosphere. The ozone layer in the Earth's atmosphere and its role for life on the planet. Global atmospheric problems. Natural and anthropogenic sources and types of air pollution. Classification of air pollution. Characteristics of pollutants and their impact on biocenoses and human health.* ***Task for self-study**: Radioecology and environmental impact of electromagnetic radiation. Electromagnetic safety. Development and evolution of information transmission systems.*
6	***The impact of human activities on the ecological state of the hydrosphere*** *Aquatic resources. The main sources of water supply. Water using in industry, utilities and agriculture. Water supply systems. Rational water using. Sources and types of pollution of surface and groundwater of continents and waters of the World Ocean. Classification of hydrosphere pollution. Influence of hydrosphere pollution on water degradation and human health.* ***Task for self-study**: Problems of providing mankind with drinking water and ways of solving them.*
7	***Disposal and recycling of waste***

	Waste generation in industrial, municipal and agricultural production. Classification of waste, methods of their utilization and disposal. Conditions for accumulation and disposal of waste. Principles of creating low-waste technological processes. ***Task for self-study**: Protection of subsoil. Minerals. Secondary resources. Household waste.*
8	***Methods of decision-making in the field of environmental protection*** *Rational using of nature. Concepts and principles of management in the field of environmental protection. Decision-making system in the field of environmental protection. Regulatory framework of Ukraine on environmental policy. Basic provisions for reducing environmental risks.* ***Task for self-study**: Alternative energy sources, their advantages over traditional ones and disadvantages.*
9	***Management in environmental protection branch*** *Environmental monitoring. Purpose, concept, principles of organization. Types of monitoring. The main tasks and monitoring scheme of the air basin, the ozone layer. Surface water quality monitoring. Monitoring the state of land resources. Principles of formation of the ecological monitoring system. The concept of environmental law. Environmental law system. Subject and methods of environmental law.* ***Task for self-study**: Sectoral, sub-sectoral and intersectoral principles of environmental law. International and national legal bases. Basic rights and responsibilities of citizens.*

Practical training

Practical classes are provided as part of the teaching of the discipline "Environmental Protection Strategies". They occupy 50% of the classroom workload. Topics which are presented for practical classes cover a wide range of questions.

They allow to understand better of lecture material, to master the method of ecological calculations, to find out the impact of certain groups of pollutants on the environment and to assess the degree of ecological risks.

The content of these classes and the methods of their conduct contribute to the development of creative activity of the individual. They develop scientific thinking and the ability to use special terminology, allow you to test knowledge. This type of work is an important means of operational feedback. Therefore, practical classes perform not only cognitive and educational functions, but are designed to promote the growth of students as creative workers in the field of ecology.

The main tasks of the cycle of practical classes are:

- ✓ *to help students to systematize, consolidate and deepen theoretical knowledge in the field of ecology and environmental protection;*
- ✓ *teach them techniques for solving practical problems;*
- ✓ *to teach students to work with scientific and reference literature, documentation and schemes;*
- ✓ *to form the ability to learn independently, to help in mastering of the methods, techniques and techniques of self-education and self-development.*

№	***Name of the topic of the classes and a list of main questions***
1	***The main provisions of modern concepts of human development and the biosphere (the concept of the noosphere, the concept of biotic regulation of the environment, the concept of coevolution of nature and society, etc.)*** *Basic definitions, concepts and laws of ecology. Ecological systems. Ecology and nature protection. History and stages of ecology development. The role of ecology in the modern development of mankind. Natural environment and its components.*

	***Task for self-study**: The relationship of ecology with other sciences. History of formation and development of ecological knowledge in Ukraine.*
2	***Sources, scale and consequences of pollution of the main ecological spheres of the planet*** *Global environmental problems of the Earth's biosphere. Impact of industrial and agricultural production on the biosphere. Pollution of the atmosphere, surface waters, oceans and lithosphere and related environmental problems. Environmental problems of planetary scale. The state of the environment in Ukraine.* ***Task for self-study**: Environmental problems of the largest cities of Ukraine.*
3	***Technosphere. Man-made impact on the environment*** *The cycle of basic elements in nature. Anthropogenic cycle of substances. Methods of disposal of industrial emissions and problems that exist in this area. Sanitary protection zones.* ***Task for self-study**: Environmental consequences of the operation of various industrial industries.*
4	***Theories of ecological development in the dimensions of ecological safety*** *Development and security as the two most important functions of the social system. Criteria for eco-progress. Ecoregress. The impact of the quality of the natural environment on human health. Hygienic criteria for environmental quality. The concept of MPC, GDS, GDV.* ***Task for self-study**: Classification of theories of ecological development.*
5	***State program of waste management in Ukraine*** *Natural resources, their using and protection. Natural resources of Ukraine. Production waste generation. Basic principles of state policy in the field of waste management. Utilization and processing of solid waste. Formation and disposal of waste from various sectors of the economy and industrial production. Waste disposal methods. Landfills. Utilization. Waste management strategy.* ***Task for self-study**: Secondary Resources. Household waste. Introduction of low-waste technologies.*
6	***Theoretical and methodological foundations of systemic environmental management*** *Methods of decision-making in the field of environmental protection. Environmental strategies in the management system of environmental safety. Eco-innovation strategies and eco-efficiency. Technological ecological strategy. Bifurcation strategy.* ***Task for self-study**: International Environmental Strategy. Passive and active environmental strategies.*
7	***Mechanisms of effective functioning of the ecological quality management system of the environment*** *Environmental law. Environmental legislation of Ukraine. Ways to implement environmental rights of citizens. Ecological examination.* ***Task for self-study**: The place of environmental law in the system of legal relations. Environmental rights guaranteed by the Constitution. International environmental organizations.*
8	***Economic mechanisms of environmental quality management*** *Economics of nature management. Methods of economic regulation in the field of environmental protection. Payments for resources, their types, standards and accrual criteria. Factors influencing the economic efficiency of the implementation of environmental measures. Environmental*

	management and audit. ***Task for self-study**: Social, environmental and economic results of environmental measures. Using a systems approach to optimize nature management processes.*
9	***Modular test***

6. Self-study

Independent work of students takes 40% of the time allocation of the course, also includes preparation for writing a modular test and preparation for the final test. The main task of students' independent work is to master scientific knowledge in the field of environmental protection, which is not included in the list of lecture topics, by personal search for information, formation of active interest and creative approach in educational process.

№	*Name of the topic for self-study*	*Number of hours*
Section 1. Priorities of state policy in the environmental sphere		
1	*The importance of ecology for human civilization. Connection of ecology with other sciences. History of formation and development of ecological knowledge in Ukraine. Ecosystem laws. The biosphere as the largest ecosystem on Earth. Ecological problems of the largest cities of Ukraine. Ecological consequences of the functioning of various industrial productions.*	*4*
Section 2. Comprehensive assessment of environmental safety at the regional, national and global levels		
2	*Classification of theories of ecological development. Features of the impact of industrial production on the environment and ways of protecting it. Problems of providing humanity with drinking water and ways of solving them. Radioecology and ecological influence of electromagnetic radiation. Electromagnetic safety. Development and evolution of information transmission systems. Sources and types of lithosphere pollution. Protection of the earth's interior. Minerals. Secondary resources. Household waste. Ways to reduce anthropogenic pressure on the environment. Introduction of low-waste technologies.*	*7*
Section 3. Management in the field of environmental protection		
3	*Sectoral, sub-sectoral and intersectoral principles of environmental law. International and national legal bases. Basic rights and responsibilities of citizens. International environmental strategy. Passive and active environmental strategies. Alternative energy sources, their advantages over traditional ones and disadvantages. The place of environmental law in the system of legal relations. Environmental rights guaranteed by the Constitution. International environmental organizations. Social, ecological and economic results of environmental measures. Using a systems approach to optimize nature management processes.*	*5*
4	*Preparation for the modular test*	*2*
5	*Preparation for the final test*	*6*
	Total hours	***24***

Attendance Policy and Assessment

7. Attendance policy

Rules of attendance and behavior in the classroom

Attendance is a mandatory component of assessment. Students are required to actively participate in the educational process, not to be late for classes and not to miss them without a sound reason, not to interfere with the teacher to conduct classes, not to be distracted by actions that are not related to the learning process.

Rules for assigning incentive and penalty points

- *incentive points can be awarded by the teacher only for the creative work in the discipline, but their amount cannot exceed 10% of the rating scale;*
- *penalty points within the discipline are not provided.*

Policy of deadlines and repeating an examination

In case of repeating an examination on the discipline or any force majeure, students should contact the teacher via available (provided by the teacher) communication channels to solve problems and agree on an algorithm for making-up the work. In case of absence on the day of writing of modular control work (MCW) a student who has provided a certificate of illness may write an MCW outside of classroom hours. Rewriting the MCW is not allowed.

The policy of academic integrity

Plagiarism and other forms of dishonesty are not allowed. Plagiarism includes the lack of links when using printed and electronic materials, citations, opinions of other authors. Copy-offs during control works are forbidden. Hints and copy-offs during tests, classes; passing a test for another student; copying of materials protected by the copyright system without the permission of the author of the work are unacceptable.

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". Details: https://kpi.ua/code.

Policy of academic behavior and ethics

Students must be tolerant, respect the opinions of others, formulate objections in the correct form, constructively provide feedback in class.

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". Details: https://kpi.ua/code.

8. Control measures and assessment polity

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

Semester	Study time		Distribution of study hours				Control activities		
	Credits	acad. hours	Lectures	Practical	Lab. work	Self-study	Modular control work	Calc. work	Semester control
3/4	2	60	18	18	–	24	1	–	test

The student's rating in the discipline consists of points for:

1) *presentation on a topic for practical classes or for independent work (in total 2 presentations for each student);*
2) *active participation at practical classes*;
3) *modular control work, which can be divided into two 45-minute or three 30-minute work.*

Semester control is a test.

System of rating (weight) points and evaluation criteria

1. *Practical work*

   1.1. *Presentation:*

   Weight point - 20. The maximum number of points in all practical lessons is

   20 points × 2 = 40 points.

Evaluation criteria:

Quality of the presentation and its assessment	***Points***
The topic of the report is fully disclosed; the student thoroughly explains all aspects of the relevant topic, makes the necessary conclusions and generalizations, as well as clearly answers the questions	*20*
The presentation does not provide enough facts and examples; proper analysis is not performed; conclusions are insufficiently clear; the answers to the questions are unclear or have some inaccuracies	*15...19*
The topic of the presentation is insufficiently disclosed; there no conclusions; there are no answers to some questions	*12...14*
The presentation does not correspond to the formulated topic; all questions were left unanswered. The report is not credited	*0*

   1.2. *Participation at practical classes:*

   Weight point – 10. The maximum number of points in all practical lessons is

   10 points × 3 = 30 points.

Evaluation criteria:

Completeness and characteristics of a response	***Points***
Active participation in the discussion of all questions, correctness of answers and performance of all tasks	*10*
Some minor mistakes when performing tasks or discussing material	*8...9*
A vague answer; gross mistakes are made; there is no specific formulation of laws and terms	*6...7*
The answer is not valid, there is no activity or preparation for the practical classes	*0*

2. *Modular control work:*

   Modular control work is carried out in the form of testing.

   In total, students have to answer 60 questions related to different sections and topics of the discipline.

   The weight point for each correct answer is 0.5. Each of the answers is evaluated separately, after which the score is summed.

   The maximum number of points for writing a modular control work is equal to

   0,5 points × 60 = 30 points.

Calculation of the rating scale (R)

The rating scale of the discipline (RD) is 100 points and is formed as the sum of all rating points obtained by the student as a result of current control measures:

$$R \quad = 20 \times 2 + 10 \times +30 = 100 \quad points.$$

According to the results of education for the first 7 weeks, an "ideal student" must score 20 points. At the first calendar control (8th week) a student receives "passed" if his current score is at least 10 points.

According to the results of 13 weeks of study, an "ideal student" must score 40 points. At the second calendar control (14th week) a student receives "passed" if his current score is at least 20 points.

A necessary prerequisite for permit to the final test is the crediting of presentations, writing of MCW, as well as a score of at least 40% of the rating scale (RD), i.e. 40 points.

Students who scored less than 0.6 R during the semester, as well as those who want to increase the overall rating, should write a test work. In this case, all points obtained during the semester are canceled. Test tasks contain questions from different sections of the program. The list of test questions is given in Section 9.

*To obtain a student test score, the sum of all rating points **R** obtained during the semester is transferred according to the table:*

Scor	***Grade***
95...100	*Excellent*
85...94	*Very good*
75...84	*Good*
65...74	*Satisfactory*
60...64	*Sufficient*
RD <60	*Fail*
Course requirements are not met	*Not Graded*

9. Additional information

An approximate list of questions for semester control

1. List the main groups of global environmental problems of mankind

2. Explain the importance of fundamental and applied ecology for the sustainable development of human civilization.

3. Describe the hygienic criteria for environmental quality. The concept of MPC, GDS, GDV.

4. Describe the main ways of solving today's environmental problems.

5. Describe the principles of creating low-waste processes. What is an obstacle to their rapid and successful implementation in production?

6. Describe the main ways of waste generation in industrial, municipal and agricultural production.

7. Explain on what principles the development of the biosphere as a dynamic system is based.

8. Describe the role of the biosphere for the emergence and development of life on Earth.

9. Describe the main stages of evolution of the biosphere. List the evidence for the evolutionary development of the Earth's biosphere.

10. Give the principles of management in the field of environmental protection.

11. List the mechanisms of effective functioning of the environmental quality management system.

12. Give the basic ideas and principles which are used for the regulation of environmental and legal relations. Regulatory framework of Ukraine on environmental policy.

13. Describe the ways to implement the environmental rights of citizens of Ukraine.

14. Describe the main provisions for reducing environmental risks in the field of environmental protection.

15. Describe the mechanism and principles of targeted use of natural objects provided by the state.

16. Describe the environmental legislation of Ukraine. Analyze the rights and responsibilities of nature users.

17. Conduct a comparative analysis of the terms "ecosystem" and "biogeocenosis". Identify the common features and differences of these concepts. In which cases should the term "ecosystem" be used, and in which - "biogeocenosis"?

18. List the existing types of ecological pyramids. Analyze how the pyramid of numbers and the pyramid of products differ. Can each of these pyramids have a different (including "inverted") appearance? What is the practical significance of knowing the laws of ecosystem productivity?

19. What does the biotic potential reflect? What role does high reproductive potential play in the regulation of population homeostasis?

20. Give a list of the main components that must exist in the ecosystem to maintain the cycle of substances in it? Identify the environmental role of producers, consumers and reducers.

21. Carry out a comparative analysis of the content of basic nutrients in the atmosphere, hydrosphere, lithosphere and biosphere. What conclusions can be drawn from the results of the analysis?

22. Analyze the peculiarities of the cycle of basic nutrients in the biosphere and identify their common features and differences.

23. Determine which stages and stages of biological cycles are limiting and can be significantly unbalanced under the influence of anthropogenic factors.

24. Describe the resource cycle as an anthropogenic cycle of substances. What are the problems with its operation?

25. Analyze the possibilities of overcoming the negative consequences of STR through the introduction of the concept of sustainable development in all spheres of modern life.

26. Describe the structure, gas composition and physicochemical properties of the atmosphere. Justify the value of these properties for the preservation of the Earth's biosphere.

27. Describe the main air pollutants and related environmental problems.

28. Analyze and compare different methods of protecting the atmosphere from anthropogenic pollution. What methods for cleaning and protecting the atmosphere from gas emissions do you know?

29. Describe the role of the ozone layer for life on Earth. What can lead to the destruction of the ozone layer and what are the possibilities of humanity to preserve it?

30. Assess the causes and possible consequences of global warming. What are the possibilities of humanity at the present stage to solve this problem?

31. Describe the preconditions for acid rain in different landscapes.

32. Describe the main causes and consequences of global atmospheric problems. What is the protection of the air at the present stage?

33. Analyze the ways of pollution of the hydrosphere and give their classification. What are the global problems of the hydrosphere.

34. Carry out a comparative analysis of the methods of drinking water purification known to you. What are the problems of water treatment today?

35. Analyze the process of water treatment for different sectors of the economy. Describe the state of water basins of Ukraine and determine the state of solving the problem of providing humanity with drinking water at the present stage.

36. Describe the processes that take place in reservoirs during their self-cleaning. What can lead to pollution of water resources by nutrients?

37. Analyze the features of water use in industry, utilities and agriculture. What types of water supply systems do you know? What does the term "rational water supply" mean?

38. Analyze and explain the causes and consequences of salinization of surface and groundwater. Suggest ways to reduce salinization of fresh and groundwater.

39. Describe the structure and chemical composition of the lithosphere. What global problems of the lithosphere are the most urgent today?

40. Evaluate the problem of soil conservation in agriculture. Describe modern methods of agriculture. What are the consequences of man-made soil pollution?

41. Describe the pros and cons of large-scale reclamation and irrigation.

42. Describe the current state of affairs regarding the study of the Earth's interior and their protection. What are the ecological and economic significance of Ukraine's minerals?

43. Give the classification of the Earth's natural resources and analyze what types of their extraction and use are the most promising for maintaining the sustainable development of the Earth's biosphere.

44. Identify the main features of the phenomenon of stratification of the atmosphere, hydrosphere and lithosphere. Assess the ecological significance of the structure of the Earth's geospheres.

45. Identify what general engineering principles and approaches can be proposed for the rational use of nature and the development of environmentally friendly technologies.

46. Justify the forms and mechanisms of degradation of the Earth's biosphere. How does the development of industrial and agricultural production affect these processes?

47. Describe the role of VI Vernadsky in creating the doctrine of the biosphere and noosphere. Define the noosphere and analyze the current state of its formation.

48. Are there prospects for preserving the diversity of animals and plants in a rapidly changing environment? What are the consequences of anthropogenic pollution for the fauna? Justify the importance of the Red Book for biodiversity conservation.

49. Describe the main ways of regulating the number of populations in the biosphere. What type of connection is used to maintain homeostasis?

50. Determine the value of nutrients to maintain homeostasis of the biosphere. Describe the mechanisms of biogeochemical provinces and biogeochemical endemics.

51. Give a list of the main demographic problems and processes that dominate the world. Suggest ways to solve these problems.

52. Analyze the demographic situation in Ukraine. Suggest ways and means to solve demographic problems.

53. Describe the methods of processing solid waste from coke production.

54. Analyze and give a brief description of the main problems of energy supply and energy consumption in the modern world. Can alternative energy sources solve existing problems? Justify your answer.

55. Describe the methods of reducing the level of radioactive contamination of the environment and the disposal of radioactive waste. Give examples of methods of neutralization of liquid radioactive effluents.

56. Describe the main ways of pollution and approaches to maintaining the homeostasis of the main geospheres of the Earth.

57. Evaluate environmental monitoring. List its types and functions. Draw a diagram of environmental monitoring.

58. Describe the purpose, objectives and stages of environmental assessment.

Syllabus

designed by Associate professor, PhD Valeriia Vember
Associate professor, PhD Viktoria Ovsyankina

adopted by

Department of Ecology and Plant Polymers Technology (Minutes No14 dated 21.02.2024)

approved by

Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute (Minutes No 5 dated 29.02.2024)