



Environmental Protection Strategy

Syllabus

Requisites of the Course

Cycle of Higher Education	<i>First cycle of higher education (Bachelor's degree)</i>
Field of Study	<i>12 Information Technologies</i>
Speciality	<i>123 Computer Engineering</i>
Education Program	<i>Computer Systems and Networks</i>
Type of Course	<i>Elective</i>
Mode of Studies	<i>full-time</i>
Year of studies, semester	<i>2 year (4 semester)</i>
ECTS workload	<i>2 credits (ECTS).</i>
Testing and assessment	<i>4 semester – Final test</i>
Course Schedule	<i>2 classes per week by the timetable http://rozklad.kpi.ua/</i>
Language of Instruction	<i>English</i>
Course Instructors	Lecturer and teacher of practical work: <i>D. Sc, Associate Professor Oleksandr Khokhotva, mobile +38-095-797-04-83, email atkinsjms@yahoo.com</i>
Access to the course	<i>Посилання на дистанційний ресурс (Moodle, Google classroom, тощо)</i>

Outline of the Course

1. Course description, goals, objectives, and learning outcomes

Development and implementation of an innovative model of economic development are related to the development of science, modern high-tech industries (information technology, radio electronics, etc.), advanced resource-saving technologies and technical means in industry, transport and everyday life, efficient zero-waste technologies, technological solutions and equipment for the treatment of industrial effluents and emissions. Therefore diverse, as well as environmental training is extremely important in today's world, which will allow future professionals to take an active part in domestic and international projects related to environmental protection and development of environmental entrepreneurship, to understand and optimally address environmental problems of regions, to be able to form effective communication strategies in order to convey ideas, problems, solutions and personal experience in the field of environment protection.

The subject of the discipline "Environmental Protection Strategy" is the process of defining the main strategies and concepts of society's interaction with the environment, the main preventive strategies for environmental protection, the main activities to ensure the rational use of natural resources. The scope of competence of this area of ecology includes the determination of priority tasks of state policy in the environmental field.

The purpose of the credit module "Environmental Protection Strategy" is the formation of students' competencies:

- understand the priorities of state policy in the environmental field;*
- propose strategies for managing the environmental safety of the regions of the country;*
- provide a comprehensive assessment of threats and risks to the state of environmental safety of the regions of the country;*
- choose the most effective and sound methods of environmental safety management that lead*

to minimization of environmental risks;

- take into account the environmental consequences when making management decisions.

According to the requirements of the program of the academic discipline, students after mastering the credit module must demonstrate the following **program learning outcomes**:

knowledge:

- properties of the biosphere and principles of its development;
- general characteristics of modern technologies and their impact on the environment;
- contradictions that arise between natural ecosystems and production;
- causes of global environmental problems in the world;
- optimal ways to solve specific global and regional environmental problems;
- the main provisions of modern concepts of development of human 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.);
- principles of formation of the environmental monitoring system;
- basic provisions for reducing environmental risks;
- basic tasks and principles of environmental expertise, environmental management and audit.

skills:

- focus on the main problems of applied ecology in order to choose the best ways of solution;
- substantiate decisions to reduce environmental risks;
- to form an algorithm for carrying out ecological expertise of objects of impact on the environment;
- choose methods for expert assessment of anthropogenic pressures on ecosystems.

2. Prerequisites and post-requisites of the course (the place of the course in the scheme of studies in accordance with curriculum)

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

3. Content of the course

Names of sections and topics	Number of hours			
	Total	including		
		Lectures	Practice	Self-study
1	2	3	4	6
Section 1. Priorities of state policy in the environmental field				
Topic 1. The concept of the environment and its protection	8	4	2	2
Topic 2. The main properties of the biosphere, the principles of its development and contradictions with objects of the technosphere	6	2	2	2
Total Section 1	14	4	4	4
Section 2. Comprehensive assessment of environmental safety at the regional, national and global level				
Topic 3. General characteristics of modern technologies and their impact on environment	9	2	4	3

Topic 4. Sources, scale and consequences of air pollution	3	2	–	1
Topic 5. The impact of human activity on environmental state of the hydrosphere	3	2	–	1
Topic 6. Utilization and processing of waste	6	2	2	2
Total Section 2	21	10	6	7
Section 3. Management in the field of environmental protection				
Topic 7. Methods of decision-making in the field of environmental protection	6	2	2	2
Topic 8. Environmental monitoring	1,5	1	–	0,5
Topic 9. Environmental management and audit	3	–	2	1
Topic 10. Environmental law	1,5	1	–	0,5
Topic 11. Environmental expertise	3	–	2	1
Total Section 3	15	4	6	5
Modular control work	4	–	2	2
Test	6	–	–	6
Total	60	18	18	24

4. Coursebooks and teaching resources

Basic literature:

1. *Environmental protection strategy: textbook. way. for students. engineering specialties of higher educational institutions / KPI them. Igor Sikorsky; уклад .: T.A. Overchenko, OI Ivanenko, VV Wember.– Kyiv: KPI im. Igor Sikorsky, 2019. - 132 p.*
2. *Bilyavsky GO, Butchenko LI, Navrotsky VM Principles of Ecology. - K .: Libra, 2002. - 352 p.*
3. *Vernadsky VI Biosphere and noosphere. - M .: Mysl, 1989. - 237 c.*
4. *Dzhygyrey B.C. Ecology and environmental protection. - K .: Znannia, 2000. - 203 p.*

Additional literature:

1. *Tinsley I. Behavior of chemical pollutants in the environment. - M .: Mir, 1982. - 281 p.*
2. *Babaev NS etc. Nuclear energy, man and the environment. M: Energoatomizdat, 1984.*
3. *Bolbas MM Fundamentals of industrial ecology. - Moscow: Higher School, 1993.*
4. *Bretschneider B., Kurfuret I. Protection of the air basin from pollution. - L: Chimiya, 1989.*
5. *Bukrinsky VV, Kovaleva NG Economic problems of nature management. - K, 1995.*
6. *Narytnik TN, Ilchenko ME, Kalinin VI Microwave telecommunication technologies and biological safety // Science and culture. - 2010.– № 35. - P.17-39.*
7. *Globalization and security of development / OG Belarus, D.G. Lukyanenko. - K.: KNEU, 2001. - 733 p.*

Educational content

5. Methodology

Lectures

Lectures are aimed at:

- providing modern and holistic knowledge in the discipline "Environmental Protection Strategy", 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 of key issues
1	<p>The concept of the environment and its protection</p> <p>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.</p>
2	<p>The main properties of the biosphere, the principles of its development and contradictions with the objects of the technosphere</p> <p>Principles of biosphere development as a dynamic system. Features of the components of the biosphere (technosphere and sociosphere). The place and responsibility of human in the biosphere. The noosphere as the latest state of 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.).</p>
3	<p>General characteristics of modern technologies and their impact on the environment</p> <p>Contradictions between natural ecological systems and production. Causes of global environmental problems in the country and the world as a whole.</p>
4	<p>General characteristics of modern technologies and their impact on the environment</p> <p>Optimal ways to solve specific global and regional environmental problems.</p>
5	<p>Sources, scale and consequences of air pollution</p> <p>Functions of the Earth's atmosphere. The ozone layer in the Earth's atmosphere and its role for life on the planet. Global problems of atmosphere. Natural and anthropogenic sources and types of air pollution. Classification of air pollution. Characteristics of pollutants and their impact on biocenoses and human health.</p>
6	<p>The impact of human activity on environmental state of the hydrosphere</p> <p>Water resources. The main sources of water supply. Water use in industry, municipal and agriculture. Water supply systems. Rational water use. Sources and types of pollution of surface and groundwater of continents and waters of the World Ocean. Classification of hydrosphere pollution. Impact of pollution of hydrosphere on water degradation and human health.</p>
7	<p>Utilization and processing of waste</p> <p>Waste generation in industrial, municipal and agricultural production. Waste classification, methods of their utilization and disposal. Conditions for accumulation and disposal of waste. Principles of creating low-waste technological processes.</p>

8	<p>Methods of decision-making in the field of environmental protection</p> <p>Rational use of natural resources. 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 environmental risks reduction.</p>
9	<p>Management in environmental protection</p> <p>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 environmental monitoring system. The concept of environmental law. Environmental law system. Subject and methods of environmental law.</p>

Practical training

As part of the teaching process, the discipline "Environmental Protection Strategy" provides practical classes, which occupy 50% of the class time. Topics at practical classes cover a wide range of issues. They provide a better understanding of the lecture material, determine the impact of certain groups of pollutants on the environment and assess the degree of environmental risks.

The main tasks of the practical classes:

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

№	Name of the topic of the classes and a list of main questions
1	<p>The main provisions of modern concepts of development of human 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.)</p> <p>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.</p>
2	<p>Sources, scale and consequences of pollution of the main ecological spheres of the planet</p> <p>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.</p>
3	<p>Technosphere. Technogenic impact on the environment</p> <p>The cycle of basic elements in the nature. Anthropogenic cycle of matters. Methods of disposal of industrial effluents and existing problems in this area. Sanitary protection zones.</p>

4	Theories of environmental development in the dimensions of environmental safety <i>Development and safety as the two most important functions of the social system. Criteria for eco-progress. Eco-regress. The impact of the quality of the environment on human health. Hygienic criteria for environmental quality. The concept of MPC, MPE.</i>
5	State waste management program <i>Natural resources, their use and protection. Natural resources of Ukraine. Generation of industrial waste. Basic principles of state policy in the field of waste management. Utilization and processing of solid waste. Generation and disposal of waste from various sectors of the economy and industrial production. Waste disposal methods. Landfills. Recycling. Waste management strategy.</i>
6	Theoretical and methodological fundamentals of systemic environmental management <i>Methods of decision-making in the field of environmental protection. Environmental strategies in the system of environmental safety management. Eco-innovation strategies and eco-efficiency. Technological ecological strategy. Bifurcation strategy.</i>
7	Mechanisms for effective functioning of the environmental management system <i>Environmental law. Environmental legislation of Ukraine. Ways to implement environmental rights of citizens. Environmental expertise.</i>
8	Economic mechanisms for environmental management <i>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 environment protection measures. Environmental management and audit.</i>
9	<i>Modular test</i>

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.

<i>№ з/п</i>	<i>Name of the topic for self-study</i>	<i>Number of hours</i>
Section 1. Priorities of state policy in the environmental area		
1	<i>The importance of environment 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. Environmental problems of the large cities. Ecological consequences of the functioning of various industrial productions.</i> <i>References: 1[25-27], 2[10-16], 26[89-90], 28[30-38]</i>	4
Section 2. Comprehensive assessment of environmental safety at the regional, national and global levels		

2	<p><i>Classification of theories of environmental development. Features of the impact of industrial production on the environment and ways to protect it. Problems of providing humanity with drinking water and ways to solve them. Radioecology and environmental impact 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 the anthropogenic load on the environment. Implementation of low-waste technologies.</i></p> <p><i>References: 4 [60-63], 5 [65-70], 8 [12-15], 11 [23-27], 13 [10-12], 14 [111-128], 18 [94-126], 22 [11-18], 23 [52-76], 24 [278-314], 29 [40-45]</i></p>	7
Section 3. Management in the field of environmental protection		
3	<p><i>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 and disadvantages in comparison with the traditional ones. 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. Application of systemic approach to optimization of nature management processes.</i></p> <p><i>References: 7 [12-20], 10 [12-20], 15[12-17], 18, 19[45-51], 20 [112-127], 25[50-52], 29[35-40]</i></p>	5
4	<i>Preparation for writing of modular test</i>	2
5	<i>Preparation for the final test</i>	6
	Total	24

Policy and Assessment

7. Course 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 can not 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. Monitoring and grading policy

At the first class the students are acquainted with the grading policy which is based on Regulations on the system of assessment of learning outcomes https://document.kpi.ua/files/2020_1-273.pdf

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

- 1) presentation on a topic for practical classes or for independent work (2 presentations for each student)
 $20 \text{ points} \times 2 = 40 \text{ points}$.
- 2) active participation at practical classes
 $10 \text{ points} \times 3 = 30 \text{ points}$.
- 3) modular control work. Control tickets consist of three questions. The weight score for each answer is 10. Each of the answers is evaluated separately, after which the scores are summed.
 $3 \times 10 \text{ points} = 30 \text{ points}$.

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

$$R = 20 \times 2 + 10 \times 3 + 10 \times 3 = 100 \text{ points.}$$

According to the university regulations on the monitoring of students' academic progress (https://kpi.ua/document_control) there are two assessment weeks, usually during 7th/8th and 14th/15th week of the semester, when students take the Progress and Module tests respectively, to check their progress against the criteria of the course assessment policy.

The students who finally score the required number of points (≥ 60) can:

- get their final grade according to the rating score;
- perform a Fail/Pass test in order to increase the grade.

Students whose final performance score is below 60 points but more than 30 are required to complete a Fail/Pass test. The list of test questions is given in Section 9. If the grade for the test is lower than the grade, which the student gets for his semester activity, a strict requirement is applied - the student's previous rating is canceled and he receives a grade based on the results of the Fail/Pass test. Students whose score is below 30 are not allowed to take the Fail/Pass test.

The final performance score or the results of the Fail/ Pass test are adopted by university grading system as follows:

Score	Grade
100-95	Excellent
94-85	Very good
84-75	Good
74-65	Satisfactory
64-60	Sufficient
Below 60	Fail
Course requirements are not met	Not Graded

9. Additional information about the course

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 of environmental quality. The concept of MPC, MPE.
4. Describe the main ways to solve contemporary environmental problems.
5. Describe the principles of creation of low-waste technological processes. What is an obstacle to their rapid and successful implementation in manufacturing?
6. Describe the main origins of waste generation in industrial, municipal and agricultural production.
7. Explain the principles the development of the biosphere as a dynamic system is based on.
8. Describe the role of the biosphere for the emergence and development of life on the Earth.
9. Describe the main steps of the biosphere evolution. List the evidence for the evolutionary development of the Earth's biosphere.
10. Provide the principles of management in the field of environmental protection.
11. List the mechanisms of effective functioning of the environmental management system.
12. Provide the basic ideas and principles of the of environmental and legal regulation.
13. Describe the ways to implement the environmental rights of citizens.
14. Describe the main provisions for reduction of environmental risks in the field of environmental protection.
15. Carry out a comparative analysis of the terms "ecosystem" and "biogeocenosis". Identify the common features and differences of these concepts. In which cases the term "ecosystem" and "biogeocenosis" should be used?
16. Describe the purpose, objectives and stages of environmental assessment.
17. 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") view? What is the practical significance of knowing the laws of ecosystem productivity?
18. What reflects the biotic potential? What role does high reproductive potential play in the regulation of population homeostasis?
19. List 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.
20. 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?
21. Analyze the peculiarities of the cycle of basic nutrients in the biosphere and identify their common features and differences.
22. Identify which steps and stages of biological cycles are limiting and can be significantly unbalanced

under the influence of anthropogenic factors.

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

24. Analyze the possibilities of overcoming the negative consequences of Science and technology revolution through the introduction of the concept of sustainable development in all spheres of modern life.

25. Describe the structure, gas composition and physical-chemical properties of the atmosphere. Justify the value of these properties for the preservation of the Earth's biosphere.

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

27. Analyze and compare different methods of atmosphere protection from pollution of anthropogenic origin. What methods for treatment and protecting the atmosphere from gas emissions do you know?

28. 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?

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

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

31. Describe the main causes and consequences of global problems of atmosphere. What is understood under protection of the air at the present time?

32. Analyze the ways of pollution of the hydrosphere and provide their classification. What are the global problems of the hydrosphere?

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

34. Analyze the process of water treatment for different sectors of the economy. Determine the state of solving the problem of providing humanity with drinking water at the present stage.

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

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?

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

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

38. Evaluate the problem of soil conservation in agriculture. Describe modern methods of agriculture. What are the consequences of technogenic soil pollution?

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

40. Describe the current state of investigation of the Earth's interior and its protection. What are the environmental and economic significance of minerals?

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

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

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

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

45. Describe the role of V.I. Vernadsky in creating the doctrine of the biosphere and noosphere. Define

the noosphere and analyze the current state of its formation.

46. Do the prospects for preserving the diversity of animals and plants exist in a rapidly changing environment? What are the consequences of anthropogenic pollution for the animal world? Justify the importance of the Red Book for biodiversity conservation.

47. Describe the main ways of regulation of population size in the biosphere. How is homeostasis of population maintained?

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

49. List the main demographic problems and processes that dominate the world. Suggest ways to solve these problems.

50. Analyze the demographic situation in the country. Suggest ways and means to solve demographic problems.

51. Describe the methods of solid waste processing from coke and by-product process production.

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

53. Describe the methods for the reduction of the level of radioactive contamination in the environment and disposal of radioactive waste. Provide examples of methods for neutralization of liquid radioactive effluents.

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

55. Evaluate environmental monitoring. List its types and functions. Draw a diagram of carrying out of environmental monitoring.

Syllabus of the course

Is designed by teacher PhD, Associate Professor, senior researcher Valeria Vember

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