



Greening of production

Work program of the discipline (Syllabus)

Requisites of the Course

Level of higher education	<i>Second (Master's)</i>
Field of Study	<i>10 Natural Sciences</i>
Program Subject Area	<i>101 Environmental Studies</i>
Education Program	<i>Environmental safety</i>
Type of Course	<i>Optional</i>
Mode of Studies	<i>full-time / distance / mixed</i>
Year of study, semester	<i>1 year (2 semester)</i>
ECTS workload	<i>5 credits (150 hours)</i>
Testing and assessment	<i>Exam</i>
Course Schedule	<i>3 classes per week (2 hours of lectures and 1 hour of practical classes)</i>
Language of Instruction	<i>Ukrainian</i>
Course Instructors	Lecturer: https://eco-paper.kpi.ua/pro-kafedru/vykladachi/vizytyky/khokhotva-oleksandr-petrovich.html Practical / Seminar: https://eco-paper.kpi.ua/pro-kafedru/vykladachi/vizytyky/khokhotva-oleksandr-petrovich.html
Access to the course	https://do.ipk.kpi.ua/

Outline of the Course

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

Ecologically unbalanced development negatively affects the functioning of industrial production. The degrading quality of the environment prevents the normal course of reproduction of the social product and labor force, worsening the economic conditions. Pollution of water, air, and soil accelerates the physical wear and tear of means of production and reduces the productivity of economic sectors.

Improving the quality of the natural environment is connected with the need to solve a complex of environmental problems in all branches of the country's production. Social production is the basis of socio-economic development. The formation of sustainable development involves, first of all, the greening of industrial production.

The current state of development of social relations with the ever-increasing anthropogenic impact on the natural environment requires a change in the attitude of humanity to the processes of production and consumption of goods. If previously economic priorities were the basis of any human actions, today ecological goals come to the fore. In other words, at the current stage of production development, every decision regarding the development of new or modernization of old production facilities must be evaluated from the standpoint of reducing the negative impact on the environment.

Greening is a process of continuous and consistent development and introduction into production processes of new technological and management measures that make it possible to increase the efficiency of the use of natural resources while preserving or improving the quality of the environment.

The subject of the discipline "Greening of production" is the process of modern production management, which ensures the combination of production efficiency with protection of the environment, including the human habitat, and with the rational use of natural resources. In the conditions of modern economic development, the greening of production requires, first of all, ecologically oriented, balanced methodological and social innovations, changes in development priorities and goals.

To successfully solve the problems of rational use and conservation of natural resources, it is necessary to create a system of environmental management at different levels of economic activity, aimed at achieving the goals of ecologically cleaner, low-waste and zero-waste production; to master the basic tools of environmental management.

The purpose of the discipline «Greening of production» is the formation in students of a system of theoretical knowledge regarding a preventive approach to environmental protection, the justification and implementation of environmental protection and resource-saving solutions in all spheres of production activity, the structure and methods of environmental management at enterprises; a set of skills and abilities necessary to assess the impact of economic activity on the environment and make reasonable management decisions in the field of environmental management, to form one's own vision for improving the greening of industrial production at various levels. In accordance with the goal, the training of Master's students in this Subject Area requires strengthening of the developed competencies:

- *the ability to apply interdisciplinary approaches to critical understanding of environmental problems;*
- *the ability to assess the level of negative impact of natural and anthropogenic factors of environmental hazards on the environment and humans;*
- *the ability to develop a complex of management solutions;*
- *the ability to collect and process information in order to obtain parameters characterizing the state of the environment.*

*According to the requirements of the program of the discipline «Greening of production», after learning it, students must demonstrate the following **program learning outcomes**:*

- *to demonstrate the ability to organize collective activities and implement complex environmental projects, taking into account available resources and time constraints;*
- *to be able to assess the potential impact of man-made objects and economic activities on the environment;*
- *to choose the optimal management strategy and/or nature management depending on ecological conditions;*
- *to know up-to-date approaches to the organization of environmentally cleaner production, reorganization and reconstruction of existing production from the standpoint of resource conservation, taking into account the life cycle of the product.*

2. Prerequisites and post-requisites of the course (the place of the course in the structural and logical scheme of the studies in accordance with educational program)

The study of the discipline «Greening of production» is based on the principles of integration of various knowledge acquired by students during the bachelor's study when studying natural and engineering disciplines. The discipline «Greening of production» is a fundamental basis that should ensure the solution of complex problems in the field of management of natural resources during the operation of enterprises and organizations and the further implementation of the sustainable development concept.

3. Content of the course

Chapter 1. Greening of production activity as a leading factor of sustainable development

Topic 1. Ecologization as a socio-economic phenomenon

Chapter 2. Basic elements of the environmental management system

Topic 2. The essence of environmental management

Topic 3. Standardization of the environmental management system

Topic 4. Preliminary ecological analysis

Topic 5. Environmental policy

Topic 6. Implementation and functioning of the environmental management system

Topic 7. Preparedness for emergency situations. Control and corrective actions

Topic 8. Audit and certification of the environmental management system

Chapter 3. Waste management system

Topic 9. Environmental management and waste management

Topic 10. Extended producer's responsibility

Chapter 4. Greening of the economy

Topic 11. The concept and assessment of the level of ecologization

Topic 12. Mechanisms of ecologization of the economy

Topic 13. Management of greening processes

Chapter 5. Environmental management tools

Topic 14. Life cycle analysis of products

Topic 15. Eco-design

Topic 16. Environmental labeling

Topic 17. Public relations and open environmental reporting

Topic 18. Environmental audit as a component of environmental management

4. Coursebooks and teaching resources

Basic literature

1. Mamenko O.M., Portiannyk S.V. *Environmental management: textbook / KhDZVA - Kharkiv, 2017. – 285 p.*
2. Galushkina T.P., Granovska L.M., Kiselyova R.A. *Environmental management and audit: Study guide. – Kherson: Oldi, 2020. – 456 p.*

Additional literature

3. *Environmental management: Study guide / Ed. V.F. Semenova, O.L. Mykhailiuk - K.: Znannia, 2006. - 366 p.*
4. Kovtun T.A. *Determination of the role of environmentalization in achieving the goals of sustainable development // Development of transport management and management methods: Collection. of science works, 2020. No. 2 (71). P. 63-81.*
5. *Environmental management: textbook / edited by V.F. Semenova, O.L. Mykhailiuk Kyiv: Center for Educational Literature, 2004. – 516 p.*
6. L. G. Melnyk *Ecological economics: textbook / L. G. Melnyk. - 3rd ed., ed. and added - Sumy: University Book, 2006. – 367 p.*
7. Yanovska E.S., Kuzovenko V.A, Dyachenko N.M. *Fundamentals of environmental management and auditing: Study guide. - K.: Publishing and Printing Center "Kyiv University", 2006. – 178 p.*
8. Kozhushko L.F. *Ecological management / L.F. Kozhushko, P.M. Skrypchuk - K.: Academy, 2007. - 430 p.*
9. Vorobey V., Zhurovska I. *Non-financial reporting: a tool of socially responsible business. K.: Ernst and Young, 2010. – 84 p.*

Information resources in the Internet

10. *Scientific and Technical Library of the Igor Sikorsky Kiev Polytechnic Institute / [Electronic resource]. - Access mode: <https://library.kpi.ua>*
11. *V. I. Vernadskyi National Library of Ukraine / [Electronic resource]. – Access mode: <http://www.nbuv.gov.ua/>*
12. *Electronic archive of Igor Sikorsky KPI scientific and educational materials / [Electronic resource]. – Access mode: <https://ela.kpi.ua/>*
13. *Ministry of Ecology and Natural Resources of Ukraine / [Electronic resource]. – Access mode: <https://mepr.gov.ua/>*

14. Professional Association of Ecologists of Ukraine (PAEU) / [Electronic resource]. – Access mode: <https://paeu.com.ua/>
15. Industrial ecology. Community of environmental specialists / [Electronic resource]. – Access mode: <http://www.eco.com.ua/>

Educational content

5. Methodology

Lectures

Lectures are aimed at:

- provision of modern, holistic, interdependent knowledge in the discipline «Greening of production», the level of which is determined by the target setting to each specific topic;
- ensuring creative work of students together with the teacher during the lecture;
- education of students' professional and business qualities and development of their independent creative thinking;
- formation of students' necessary interest and directing for independent work;
- reflection of the methodical processing of the material (highlighting of the main provisions, conclusions, recommendations, clear and adequate wording of them);
- teaching research materials in a clear and high-quality language with observance of structural and logical connections, clarification of all newly introduced terms and concepts;
- accessibility for perception by the audience.

№	The title of the lecture topic and the list of main issues (list of teaching tools, references to literature and tasks for the ISW)	Hours
1	<p>Ecologization as a socio-economic phenomenon</p> <p>The role of greening in achieving the goals of sustainable development. The concept of greening production in the context of neo-industrial development. Peculiarities of the process of environmentalization of enterprises in modern conditions.</p> <p>Literature: [4] P. 63-81.</p> <p>Tasks on ISW. Organizational and economic mechanism of greening.</p>	2
2	<p>The essence of environmental management</p> <p>Types of management at an enterprise. Fundamentals of modern environmental management. Principles, tasks and functions of environmental management. Brief historical information and stages of development of environmental management. The main stages of the development of an enterprise in the field of environmental management.</p> <p>Literature: [1] C. 12-22; [3] C. 115-120.</p> <p>The task for ISW. The state of environmental management in Ukraine. International approach to environmental management.</p>	2
3	<p>Standardization of the environmental management system</p> <p>Development of standardization in the field of environmental management. Group of standards ISO 14000, EMAS, BS 8555. Their comparison.</p> <p>Literature: [2] C. 88-94; [3] C. 160-165.</p> <p>The task for ISW. Reasons for the implementation of EMS. Directions of practical activities of environmental management.</p>	2
4	<p>Preliminary environmental analysis</p>	2

	<p><i>Environmental aspects and impact on the environment. Direct and indirect aspects. Methodology of preliminary environmental analysis.</i></p> <p><i>Literature: [5] C. 118-128.</i></p> <p><i>The task for ISW. Stages of environmental management at the enterprise.</i></p>	
5	<p>Environmental policy</p> <p><i>Definition of environmental policy. Types and principles of environmental policy. Development of the organization's environmental policy. Publication and implementation of environmental policy. The structure of the environmental management system at the enterprise.</i></p> <p><i>Literature: [3] C. 147-150; [5] C. 115-118.</i></p> <p><i>The task for ISW. Requirements for environmental management planning.</i></p>	2
6	<p>Implementation and functioning of the environmental management system</p> <p><i>Organizational structure and responsibility in the implementation of SEM. Training and education of personnel. Communications and information exchange. Documentation of the environmental protection management system and documentation management. Operational control.</i></p> <p><i>Literature: [5] C. 132-164.</i></p> <p><i>The task for ISW. Connection of the environmental management system with other management systems at enterprise.</i></p>	2
7	<p>Preparedness for emergency situations. Control and corrective actions</p> <p><i>Preparedness for emergency situations and response to them. Monitoring, control and corrective actions in the environmental management system. Management analysis.</i></p> <p><i>Literature: [5] C. 164-183.</i></p> <p><i>The task for ISW. Evaluation of the effectiveness of the implementation of EMS.</i></p>	2
8	<p>Audit and certification of the environmental management system</p> <p><i>Environmental management system audit. Types of audits. Basic principles of auditing environmental management systems. Audit criteria. Certification of environmental management systems. Integration of EMS with other management systems.</i></p> <p><i>Literature: [5] C. 189-198; [6] C. 93-102.</i></p> <p><i>The task for ISW. Certification and self-declaration.</i></p>	2
9	<p>Environmental management and waste management</p> <p><i>Characteristics of waste streams. Waste management system. Concepts of waste management. Waste management tools.</i></p> <p><i>Literature: [5] C. 73-75.</i></p> <p><i>The task for ISW. Environmental passporting of man-made objects.</i></p>	2
10	<p>Extended producer's responsibility</p> <p><i>The concept of EPR. Objectives of EPR. Types of producer responsibility. Defining and ensuring compliance with performance targets. Approaches to the application of EPR in environmental policy.</i></p> <p><i>Literature: [7] C. 148-158.</i></p> <p><i>The task for ISW. Implementation of EPR principles in global practice.</i></p>	2

11	<p>The concept and evaluation of the level of environmentalization The concept of environmentalization. Estimates of the level of environmentalization ISW. Literature: [6] P. 216-231. Tasks on ISW. Environmental and economic tools.</p>	2
12	<p>Mechanisms of ecologization of the economy Reproducible mechanism of environmentalization. Greening of demand. Greening of production. Environmentalization of people and reproduction of environmentalization motives. Literature: [6] P. 232-251. Tasks on ISW. Determining the environmental price of goods and services.</p>	2
13	<p>Management of greening processes “Square” of management of greening. Management strategies of influence on the subjects of greening. Literature: [6] P. 252-278. Tasks on SRS. Accounting for time and uncertainty factors when conducting ecological and economic assessments.</p>	2
14	<p>Life cycle analysis of products Life cycle concept. Development of the life cycle concept. Areas of practical application of LCA. Components of the methodology. Problem formulation. Setting the boundaries of research. Determining the purpose of the product and the functional unit. Inventory analysis. Allocation. Environmental impact assessment. Limitations of LCA. Literature: [5] C. 208-215; [7] C. 158-162. The task for ISW. Life cycle of the company.</p>	2
15	<p>Eco-design Product system. Design tools and strategies. Fundamentals of product life cycle design. Problems of eco-design. Literature: [5] C. 215-219; [7] C. 175-186. The task for ISW. Eco-design in the service sector.</p>	2
16	<p>Environmental labeling Programs of ecological labeling. Purpose of ecological labeling. Information provision of ecological labeling. Positive and negative ecological labeling. Types of ecological signs. The process of assigning environmental marks. General features of existing ecological labeling schemes. Funding of ecological labeling programs. Literature: [2] C. 178-182; [5] C. 219-223; [7] C. 158-162. The task for ISW. Marketing mechanism of environmental protection management.</p>	2
17	<p>Public relations and open environmental reporting Types of public relations. Social responsibility of business and reporting. Benefits of non-financial reporting for companies. Risks of non-financial reporting. Formats of non-financial reporting. Literature: [5] C. 223-226; [8] C. 6-28. The task for ISW. Reporting system Global Reporting Initiative.</p>	2
18	<p>Environmental audit as a component of environmental management</p>	2

	<p><i>Concept of environmental audit. Purpose, tasks and functions of environmental audit. Environmental audit objects and subjects. Principles and types of environmental audit. Environmental audit plan.</i></p> <p><i>Literature: [1] C. 125-135; [3] C. 228-267; [4] C. 104-126.</i></p> <p><i>The task for ISW. The main criteria for choosing an eco-audit methodology.</i></p>	
	Total	36

Practical training

In the system of professional training of students in this discipline, practical classes take 35% of the classroom hours. As a supplement to the lecture course, they lay and form the basis of the master's qualification in ecology, namely organizational methods of reducing anthropogenic load in the process of economic activity. The content of these classes and the method of conducting them should ensure the development of the creative activity of the individual. They develop scientific thinking and the ability to use special terminology, allow you to check knowledge, therefore this type of work is an important means of operational feedback. Practical classes should perform not only cognitive and educational functions, but also contribute to the growth of masters as creative employees in the field of environmental protection.

The main tasks of the practical classes:

- *to help students systematize, consolidate and deepen knowledge of a theoretical nature in the field of environmental management and audit;*
- *to teach them to work with scientific and reference literature and diagrams;*
- *to form the ability to learn independently, that is, to master the methods, ways and techniques of self-learning, self-development and self-control.*

No	The title of the topic of practical classes and the list of main issues (list of teaching tools, references to literature and tasks for the ISW)	Hours
1	<p>The concept of sustainable development of the world and the principles of greening production</p> <p><i>The role of greening in achieving the goals of sustainable development. Prerequisites of environmentalization of industrial activity. Environmental and socio-economic results of greening production and environmental protection measures.</i></p> <p><i>Literature: [4] P. 63-81.</i></p> <p><i>The task for ISW. Economic growth, poverty and the environment.</i></p>	2
2	<p>Mechanisms and main tools of production greening</p> <p><i>Organizational and economic mechanism of greening. Peculiarities of the process of environmentalization of enterprises in modern conditions.</i></p> <p><i>Literature: [6] P. 130-150.</i></p> <p><i>Tasks on ISW. Managerial decisions in management.</i></p>	2
3	<p>Environmental management. Environmental policy</p> <p><i>Environmental management implementation tools. The main elements of the organization's environmental policy. Analysis of examples of environmental policy of enterprises of various industries.</i></p> <p><i>Literature: [1] P. 31-39; [8] P. 93-97; [3] c. 32-69.</i></p> <p><i>Tasks on ISW. Prerequisites and benefits of implementing a corporate environmental management system.</i></p>	2
4	<p>Structures of environmental management at the enterprise</p> <p><i>The selection of the structure of environmental management. Advantages and disadvantages of different structures. Justification of the choice of structure and its implementation.</i></p> <p><i>Literature: [5] C. 88-106.</i></p>	2

	<i>The task for ISW. Feasibility of involving consultants in the process of implementing an environmental management system.</i>	
5	Corporate environmental management <i>Prerequisites and benefits from the implementation of the corporate environmental management system. Purpose and basic principles of corporate environmental management system creation. Preliminary comprehensive analysis of environmental aspects of the corporation.</i> <i>Literature: [4] C. 42-50.</i> <i>The task for ISW. Regulation of the interaction of executive authorities in the field of environmental protection.</i>	2
6	Functional economy as a modern approach to greening production <i>Product-service system. Concept of functional economy, its main provisions.</i> <i>Literature: [8] P. 152-158.</i> <i>The task for ISW. To investigate the prospects of the transition to a functional economy in the conditions of modern economic development of Ukraine.</i>	2
7	Elements of the methodology of product life cycle analysis <i>Determination of the boundaries of the analysis and the functional unit.</i> <i>Literature: [1] C. 170-185; [3] c. 140-152.</i> <i>The task for ISW. Use of LCA in ecolabelling.</i>	2
8	Greening of the economy <i>Assessment of the level of environmentalization. The motivation for greening. Practical procedures for managing the greening of the economy and its subdivisions.</i> <i>Literature: [6] P. 216-270.</i> <i>Tasks on ISW. Foreign experience of greening.</i>	2
9	<i>Modular control work</i>	2
	Total	18

6. Self-study

Independent work takes 65% of the time of studying the credit module, including preparation for the exam and writing the Home control work. The main task of independent master's work is to acquire knowledge in areas that are not included in the list of lecture topics by personally searching for information, forming an active interest in a creative approach to educational work. In the process of independent work within the framework of the educational component, the student must learn to deeply analyze modern approaches to the organization and implementation of the environmental management system at the enterprise. He should be able to identify the shortcomings of the elements of the existing environmental management and propose ways to correct the inconsistencies.

<i>№</i>	<i>Name of the topic for self-study</i>	<i>Hours</i>
Chapter 1. Greening of production activity as a leading factor of sustainable development		
<i>1</i>	<i>The state of greening of production in Ukraine. Approach to greening in industrially developed countries. Principles of greening production. Environmental risk and its management. The system of quotas for emissions of harmful substances. Environmental licensing and certification. Environmental management of the enterprise.</i>	<i>6</i>
Chapter 2. Basic elements of the environmental management system		
<i>2</i>	<i>Directions of practical activities of environmental management. Training and information exchange in the organization. Principles of environmental management. The structure of the environmental management system at the enterprise. Communications in the environmental management system. Connection of the environmental management system with other enterprise management systems. Evaluation of the effectiveness of the implementation of EMS. Tasks, roles and distribution of responsibilities when conducting an audit of</i>	<i>18</i>

	<i>the EMS. Qualification criteria of an ecologist-auditor. External and internal audit of EMS. Environmental goals and objectives. Environmental procedures. Types of environmental procedures. Development of environmental procedures.</i>	
Chapter 3. Waste management system		
3	<i>Supply system management. Environmental insurance. Areas of EPR implementation. Green dot. Implementation of EPR in Ukraine.</i>	6
Chapter 4. Greening of the economy		
4	<i>Resource assessments and environmental assessments. Approaches to the economic evaluation of natural resources. Approaches to the assessment of changes in the state of the environment.</i>	6
Chapter 5. Environmental management tools		
5	<i>Life cycle of the enterprise. Life cycle analysis of bioethanol, biodiesel and biogas. Use of AHC for environmental labeling. Environmental labeling in Ukraine. Marketing mechanism of environmental protection management. Environmental labels and declarations. Voluntary environmental report. Conducting an environmental audit of the enterprise. Audit of emissions into the atmosphere. Audit of water consumption and drainage. Waste audit. Report on environmental audit. Rights and obligations of eco-auditors. Non-financial reporting as a means of communication with stakeholders.</i>	14
6	<i>Preparation for writing of Modular control work</i>	6
7	<i>Making Home control work</i>	10
8	<i>Preparation for the exam</i>	30
	Total	96

Policy and Assessment

7. Course policy

Rules of attendance and behavior in the classroom

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 exclusively for the creative works in the discipline or additional completion of online specialized courses with the receipt of the respective certificate:*
 - <https://www.coursera.org/learn/environmental-management-ethics>
 - <https://www.coursera.org/learn/global-environmental-management>.

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 arrears from the academic discipline or any force majeure circumstances, students should contact the teacher through the available (provided by the teacher) communication channels to resolve problematic issues and agree on the algorithm of actions for practice.

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

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

Semester	Study time		Distribution of study hours				Control measures		
	Credits	acad. hours	Lecture	Practical	Lab. work	ISW	MCW	HCW	Semester control
2	5	150	36	18	–	96	1	1	exam

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

The student's rating from the credit module consists of points received for

- work in practical classes,
- writing modular control work (1 MCW is divided into two one-hour works),
- writing home control work.

Semester control is the exam.

The system of rating (weight) points and evaluation criteria

Rating points system and evaluation criteria:

1. Performing assignments in the practical classes (four responses by each student during the semester).

The weighted score for one practical class is 5 points.

Criteria for evaluating the performance of a practical assignment

Completeness and signs of task completion	Score
The task is fully completed	5
Incomplete answer	4
Incomplete answer, significant errors	3
Poor execution of the task, superficial answer	1-2
Failure to complete the task	0

2. Modular control work.

The weighted score is 10 points. The weighted score for each modular control work is 5 points.

Criteria for evaluating the performance of a control work.

Completeness and signs of task completion	Score
The task is fully completed	5
Minor errors	4
Incomplete answer and/or gross errors	3
Poor execution of the task, superficial answer	1-2
Failure to complete the task	0

3. Home control work.

The weighted score is 20 points.

Completeness and signs of task completion	Score
The task is fully completed	19-20
Minor errors	16-18
Incomplete answer	12-15
Failure to complete the assignment on time and/or gross errors	7-11

Poor execution of the task, superficial answer	1-6
Failure to complete the task	0

Thus, the starting rating scale of the credit module is:

$$R_s = 4 \cdot 5 + 2 \cdot 5 + 20 = 50 \text{ points}$$

The component of the examination scale is 50 % of R:

$$R_{ex} = 50 \text{ points.}$$

The rating scale of the credit module is:

$$R = R_s + R_{ex} = 50 + 50 = 100 \text{ points}$$

A prerequisite for admission to the exam is a starting rating of at least 30 points.

According to the results of the education for 7 weeks of study, the "ideal student" should score 20 points. A student receives "passed" if his current rating is at least 10 points. According to the results of 13 weeks of study, the "ideal student" should score 40 points. At the second certification (14th week), the student receives "passed" if his current rating is at least 20 points.

A prerequisite for admission to the exam is the completion of all practical tasks, home control work and starting rating of at least 25 points.

Students with rating score less than 0.5 R_s during the semester are not allowed to take the exam and must improve their rating.

The list of exam questions is given in Chapter 9. During the exam, students answer 2 questions, each of which is evaluated at max 25 points.

Criteria for evaluating answers on the exam

Completeness and signs of task completion	Score
Complete answer, at least 90% of the required information	23-25
A sufficiently complete answer, at least 75% of the required information, minor errors	19-22
Incomplete answer, significant errors, at least 60% of the required information	15-18
Incomplete answer and/or gross errors	7-14
The answer is superficial without a proper analysis of the parameters without a full understanding of the essence	1-6
Failure to complete the task	0

To obtain the final grade, the sum of the received starting points and points for the answers on the exam is translated according to the table:

Score	Grade
95...100	Excellent
85...94	Very good
75...84	Good
65...74	Satisfactory
60...64	Sufficient
$RD < 60$	Fail
Admission conditions not met	debarred

9. Additional information about the course

An approximate list of questions for modular control work

1. Describe the motivations for greening production.
2. Describe the main approaches to greening production.

3. Describe the mechanisms of ecologization of the economy.
4. Explain the relationship between environmental policy, goals and objectives. Specify the criteria for developing goals and objectives.
5. Describe the processes of greening the economy and their management.
6. Justify the main objectives of the preliminary environmental analysis.
7. The main regulatory legal acts of Ukraine in the field of nature management.
8. Explain the importance of corrective and preventive actions in the functioning of the environmental management system, the difference and commonality between them.
9. Describe the hierarchical structure of the waste management system.
10. Describe the purpose of monitoring at the enterprise and its metrological support.
11. List the risks and difficulties in the development of open environmental reporting.
12. Describe the procedure for granting ecolabels.

An approximate list of questions for exam

1. Formulate the essence and principles of greening production.
2. Explain the connection between the concept of sustainable development and greening of production.
3. Describe the main elements of the environmental management system at the enterprise.
4. Describe the features of environmental management in Ukraine.
5. Describe the purpose and tasks of environmental management at the enterprise.
6. Explain the connection of the environmental management system with other enterprise management systems.
7. Explain the need for environmental licensing and certification.
8. Describe the objects and subjects of environmental management.
9. Describe the environmental management system documentation.
10. Describe the environmental policy of the enterprise.
11. Give the methods of dissemination of environmental policy.
12. Analyze the criteria for developing environmental goals and objectives.
13. Explain the difference between target and planned environmental indicators.
14. Describe the essence, content and functions of international and national standards ISO 14000 series.
15. State the main goals and features of the EMAS international standard.
16. Stages of the process of drawing up environmental procedures.
17. State the main objectives of preliminary environmental analysis.
18. Describe the structure and distribution of responsibilities when implementing an environmental management system.
19. Describe the stages of implementation of the environmental management system at the enterprise.
20. Describe the stages of SEM implementation that are key to implementing the concept of continuous improvement.
21. Explain the essence of monitoring in the environmental management system, its types and purpose.
22. Formulate the purpose and tasks of the environmental management system audit. External and internal audit.
23. State the requirements for the auditor when conducting an environmental management system audit.
24. Explain the common difference in the concept of "non-compliance" in the implementation of SEM and in the certification audit of SEM.
25. Describe communications in the environmental management system.
26. Describe the main principles of economic regulation of the waste management system.
27. Reveal the essence of control and responsibility in the field of waste management.
28. Explain the concept of extended producer responsibility. List the types of producer responsibility.

29. Give examples of the use of extended producer responsibility in environmental policy.
30. Describe the concept of the product life cycle.
31. List the main components of the life cycle analysis methodology.
32. List the areas of practical use of life cycle analysis.
33. Show the disadvantages of the life cycle analysis approach.
34. Describe the problem of the distribution of impacts during life cycle analysis and provide ways to solve it.
35. Describe eco-labelling programs. The purpose of environmental labeling.
36. Describe positive and negative environmental labeling. Types of ecological signs.
37. Explain the use of the life cycle analysis approach in ecolabelling.
38. Explain the importance of the company's relations with the public on the way to the greening of production.
39. Describe the methods of external communication of the enterprise.
40. Explain the motivations for preparation and compare the methods of distribution of open environmental reporting.
41. Describe the essence and causes of risks and difficulties in the development of open environmental reporting.
42. Describe the benefits of open environmental reporting for companies.

An approximate list of questions for home control work

1. Socio-economic motivation and consequences of greening production.
2. Greening as an objective process of economic development of the enterprise.
3. Environmental aspects of investment processes.
4. Basic strategies of an environmentally friendly enterprise.
5. Greening of project solutions.
6. Domestic and foreign experience of implementing production greening programs.
7. Engineering and management approaches to environmentalization of the enterprise.
8. The system of indicators of environmental friendliness of production and determination of the effectiveness of environmental activities.
9. Greening of production in the context of Abraham Maslow's theory of the hierarchy of needs.
10. The application of LCA to increase the environmental friendliness of the enterprise.

Syllabus of the course:

Is designed by D.Sc, Associate Professor Oleksandr Khokhotva

Adopted by Department of Ecology and Plant Polymers Technology (protocol № 14 dated 08.06.2022)

Approved by the Methodology Board of the Faculty (protocol № 10 dated 24.06.2022)