Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Ecology and plant polymers technology

Environmental Management and Audit

Work program of the discipline (Syllabus)

Requisites of the Course

Level of higher education	***Second (Master's)***
Field of Study	*16 Chemical and Bioengineering*
Program Subject Area	*161 Chemical Technology and Engineering*
Education Program	*Industrial ecology and resource efficient cleaner technologies*
Type of Course	*Optional*
Mode of Studies	*full-time / distance / mixed*
Year of study, semester	*1 year (2 semester)*
ECTS workload	*5 credits (150 hours)*
Testing and assessment	*Exam*
Course Schedule	*3 hours per week (2 hours of lectures and 1 hour of practical classes)*
Language of Instruction	*Ukrainian*
Course Instructors	Lecturer: *https://eco-paper.kpi.ua/pro-kafedru/vykladachi/vizytky/khokhotva-oleksandr-petrovich.html* Practical / Seminar: *https://eco-paper.kpi.ua/pro-kafedru/vykladachi/vizytky/khokhotva-oleksandr-petrovich.html*
Access to the course	*https://do.ipo.kpi.ua/course/view.php?id=4329*

Outline of the Course

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

The development of human society is closely related to the surrounding natural environment, therefore, the strengthening of anthropogenic impact on it necessitates the need to outline promising goals for the preservation and restoration of territories, greening of production, rational use of natural resources, and environment conservation. The last decades are characterized by a deep rethinking of the ways of further economic development of society. This rethinking was embodied in the ideology of sustainable development adopted by the world community. Ensuring balanced socio-economic and ecological development of both the state and its regions, as well as the functioning of their economic complex, is carried out on the basis of three components: satisfaction of growing material and spiritual needs, as well as raising the living standard of the population; rational and ecologically safe management and highly efficient use of natural resources; maintenance of favorable, from the point of view of the interests of human health, natural and ecological living conditions, preservation, reproduction and multiplication of the quality of the environment and natural resource potential in the interests of current and future generations.

One of the tools for implementing this principle is environmental management. The "Agenda XXI" adopted at the UN World Conference on Sustainable Development emphasized that environmental management should be considered a key dominant feature of sustainable development and at the same time one of the highest priorities of industrial activity and entrepreneurship.

***The subject** of the discipline "Environmental Management and Audit" is the process of managing present-day production, which ensures the combination of production efficiency with environmental*

protection, including human habitat, and rational use of natural resources. In the conditions of the today's environmental crisis, the strategy of environmental management is a scientifically based direction of the development of the system "human - biosphere".

In order to successfully solve the problems of rational use and conservation of natural resources, it is necessary to apply in practice the norms of environmental law in the system of environmental management; to create an environmental management system at different levels of economic activity aimed at achieving the goals of clean, low-waste and zero-waste production; to master the basic tools of environmental management.

***The purpose** of the discipline "Environmental Management and Audit" is the formation of theoretical knowledge of environmental problems in the reconstruction of the economic mechanism, structure and methods of environmental management at enterprises, organizations, institutions, and firms of various forms of ownership; a set of skills and abilities necessary to assess the potential impact of economic activity on the environment and to make balanced management decisions related to the field of environmental management, to evaluate various processes of environmental management and audit, to form own vision for the improvement of environmental management processes 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 organize and manage chemical-technological processes in the conditions of industrial production and in research laboratories, taking into account social, economic and environmental aspects;*
- *the ability to apply new approaches to the analysis and forecasting of complex phenomena, critical understanding of problems in professional activity;*
- *the ability to organize work related to the assessment of the ecological state, environmental protection and optimization of nature management.*

*According to the requirements of the program of the discipline "Environmental Management and Audit", after learning it, students must demonstrate the following **program learning outcomes**:*

- *to organize own work and the team work in the conditions of industrial production, project divisions, research laboratories, to determine goals and effective ways to achieve them, to motivate and train personnel;*
- *to develop and implement projects in the field of chemical technologies and related interdisciplinary projects taking into account social, economic, environmental and legal aspects;*
- *to demonstrate awareness of the latest principles and methods of environmental protection;*
- *to know up-to-date approaches to the organization of environmentally friendly productions, reorganization and reconstruction of existing productions from the standpoint of resource conservation.*

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 "Environmental Management and Audit" 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 "Environmental Management and Audit" 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. Conceptual and normative-methodical foundations of environmental management

Topic 1. The essence of environmental management

Topic 2. Regulatory and legal basis of environmental management

Chapter 2. Basic elements of the environmental management system

Topic 3. Standardization of the environmental management system
Topic 4. Environmental policy
Topic 5. Preliminary environmental analysis
Topic 6. Implementation of environmental policy
Topic 7. Implementation and functioning of the environmental management system
Topic 8. Preparedness for emergency situations. Control and corrective actions
Topic 9. Audit and certification of the environmental management system

Chapter 3. Waste management system

Topic 10. Environmental management and waste management
Topic 11. Extended producer's responsibility

Chapter 4. Other environmental management tools

Topic 12. Life cycle analysis of products and methodology of life cycle analysis
Topic 13. Eco-design
Topic 14. Environmental labeling
Topic 15. Public relations and open environmental reporting

Chapter 5. Environmental audit

Topic 16. Environmental audit as a component of environmental management
Topic 17. Organizational and legal aspects of environmental audit
Topic 18. Environmental insurance in the environmental management system

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. *Law of Ukraine "On Environmental Protection", No. 2717-IX dated 25.06.1991. Date of update: 03.11.2022. URL: https://zakon.rada.gov.ua/laws/show/1264-12 (accessed 25.05.2024).*
4. *Andrusiak N.S. Environmental management and audit: textbook. Chernivtsi: RODOVID Publishing House, 2013. – 195 p.*
5. *Fundamentals of environmental management: [textbook] / O. B. Kuzmenko, V. I. Andreev - Mykolaiv: Petro Mohyla Black Sea State University Publishing House, 2013. 160 p.*
6. *Environmental management systems: current trends and international standards. Study book / S.V. Berzina, I.I. Yareskovska et al. - K: Institute of Environmental Management and Balanced Nature Management, 2017. 134 p.*
7. *The Law of Ukraine "On Waste Management" of 20.06.2022 No. 2320-IX. Date of update: 13.12.2022. URL: https://zakon.rada.gov.ua/laws/show/2320-20 (accessed 25.05.2024).*
8. *Zvarych, I. Extended Producer Responsibility in the Concept of Circular Economy Development / Roman Zvarych, Iryna Zvarych // World of Finance. - 2019. - Issue 3. - P. 76-86.*

Information resources in the Internet

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

Educational content

5. Methodology

Lectures

Lectures are aimed at:

- *provision of modern, holistic, interdependent knowledge in the discipline "Environmental Management and Audit", 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	***The essence of environmental management*** *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.* *Literature: [1] P. 12-22; [4] P. 9-18.* *The task for ISW. The state of environmental management in Ukraine. International approach to environmental management.*	2
2	***Regulatory and legal basis of environmental management*** *Legislative provision of environmental management. The concept and essence of environmental regulation. Stages of implementation of environmental regulation.* *Literature: [1] P. 66-91; [3].* *The task for ISW. Environmental risk and its management. The system of quotas for emissions of harmful substances. Environmental licensing and certification.*	2
3	***Standardization of the environmental management system*** *Development of standardization in the field of environmental management. Group of standards ISO 14000, EMAS, BS 8555. Their comparison.* *Literature: [2] P. 88-94; [5] P. 6-14.* *The task for ISW. Reasons for the implementation of EMS. Directions of practical activities of environmental management.*	2
4	***Environmental policy*** *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.* *Literature: [5] P. 31-35.*	2

	The task for ISW. Requirements for environmental management planning.	
5	***Preliminary environmental analysis*** *Environmental aspects and impact on the environment. Direct and indirect aspects. Methodology of preliminary environmental analysis.* *Literature: [6] P. 74-78.* *The task for ISW. Stages of environmental management at the enterprise.*	***2***
6	***Implementation of environmental policy*** *Environmental goals and objectives. Environmental procedures. Types of environmental procedures. Development of environmental procedures.* *Literature: [5] P. 36-47.* *The task for ISW. Responsibility for the implementation of environmental policies.*	***2***
7	***Implementation and functioning of the environmental management system*** *Organizational structure and responsibility in the implementation of EMS. Training and education of personnel. Communications and information exchange. Documentation of the environmental protection management system and documentation management. Operational control.* *Literature: [5] P. 49-60; [6] P. 79-84.* *The task for ISW. Connection of the environmental management system with other management systems at enterprise.*	***2***
8	***Preparedness for emergency situations. Control and corrective actions*** *Preparedness for emergency situations and response to them. Monitoring, control and corrective actions in the environmental management system. Management analysis.* *Literature: [5] P. 73-96.* *The task for ISW. Evaluation of the effectiveness of the implementation of EMS.*	***2***
9	***Audit and certification of the environmental management system*** *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.* *Literature: [1] P. 117-122; [5] P. 112-126.* *The task for ISW. Certification and self-declaration.*	***2***
10	***Environmental management and waste management*** *Characteristics of waste streams. Waste management system. Concepts of waste management. Waste management tools.* *Literature: [7].* *The task for ISW. Environmental passporting of man-made objects.*	***2***
11	***Extended producer's responsibility*** *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.* *Literature: [8].* *The task for ISW. Implementation of EPR principles in global practice.*	***2***
12	***Life cycle analysis of products and methodology of life cycle analysis***	***2***

	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. Distribution. Environmental impact assessment. Sensitivity analysis. Evaluation of improvements. Limitations of LCA. *Literature: [6] P. 91-108.* *The task for ISW. Life cycle of the company.*	
13	***Eco-design*** *Product system. Design tools and strategies. Fundamentals of product life cycle design. Problems of eco-design.* *Literature: [5] P. 215-219.* *The task for ISW. Eco-design in the service sector.*	***2***
14	***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.* *The task for ISW. Marketing mechanism of environmental protection management.*	***2***
15	***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: [6] P. 118-122.* *The task for ISW. Reporting system Global Reporting Initiative.*	***2***
16	***Environmental audit as a component of environmental management*** *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.* *Literature: [1] P. 125-135; [4] P. 104-126; [5] P. 133-136.* *The task for ISW. The main criteria for choosing an eco-audit methodology.*	***2***
17	***Organizational and legal aspects of environmental audit*** *The sequence of 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.* *Literature: [1] C. 135-140; [4] C. 126-139.* *The task for ISW. Eco-audit in the modern economy of Ukraine.*	***2***
18	***Environmental insurance in the environmental management system*** *Terms of environmental insurance. Global experience of environmental insurance. The concept of 'pollution' in environmental insurance, classification of losses.* *Literature: [2] P. 111-117.* *The task for ISW. Possibilities of environmental insurance in Ukraine.*	***2***

	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.*

№	***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	***The concept of sustainable development of the world and the principles of environmental management*** *Basic principles of managing processes, mechanisms and management systems. Ecological and socio-economic results of environmental management and environmental protection measures.* *Literature: [1] P. 25-39.* *The task for ISW. Economic growth, poverty and the environment.*	***2***
2	***Environmental management, its tools and tasks*** *Mechanisms and main tools of implementation of environmental management.* *Literature: [1] P. 31-39.* *The task for ISW. Prerequisites and benefits of implementing a corporate environmental management system.*	***2***
3	***Environmental policy. Development of environmental policy*** *The main elements of the organization's environmental policy. Analysis of examples of environmental policy of enterprises of various industries.* *Literature: [6] P. 68-71.* *The task for ISW. Managerial decisions in management.*	***2***
4	***Structures of environmental management at the enterprise*** *The selection of the structure of environmental management. Advantages and disadvantages of different structures. Justification of the choice of structure and its implementation.* *Literature: [5] P. 36-48.* *The task for ISW. Feasibility of involving consultants in the process of implementing an environmental management system.*	***2***
5	***Mechanisms and means of corporate environmental management*** *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.*	***2***

	Literature: [4] P. 42-50. *The task for ISW. Regulation of the interaction of executive authorities in the field of environmental protection.*	
6	***Extended producer responsibility. Functional economy*** *Examples of implementation of extended producer responsibility in Ukraine. Product-service system. Concept of functional economy, its main provisions.* *Literature: [8].* *The task for ISW To investigate the prospects of the transition to a functional economy in the conditions of modern economic development of Ukraine.*	***2***
7	***Elements of the methodology of product life cycle analysis*** *Determination of the boundaries of the analysis and the functional unit.* *Literature: [1] P. 170-185.* *The task for ISW. Use of LCA in ecolabelling.*	***2***
8	***Non-financial environmental reporting*** *Public Relations. Environmental reporting. Triple summary of EMS (environmental, economic, social). Reporting system Global Reporting Initiative.* *Literature: [2] C. 122-125.* *The task for ISW. International standards for non-financial corporate reporting.*	***2***
9	*Modular control work*	***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.

№	*Name of the topic for self-study*	*Hours*
Chapter 1. Conceptual and normative-methodical foundations of environmental management		
1	*The state of environmental management in Ukraine. International approach to environmental management. Principles of environmental management. Environmental risk and its management. The system of quotas for emissions of harmful substances. Environmental licensing and certification. Environmental policy in the practice of environmental management of the enterprise.*	*8*
Chapter 2. Basic elements of the environmental management system		
2	*Reasons for the implementation of EMS. Implementation costs. 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 the EMS. Qualification criteria of an ecologist-auditor. External and internal audit of EMS.*	*16*
Chapter 3. Waste management system		
3	*Supply system management. Environmental insurance. Areas of EPR implementation. Green dot. Implementation of EPR in Ukraine.*	*6*
Chapter 4. Other environmental management tools		

4	*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.*	8
Chapter 5. Environmental audit		
5	*The main criteria for choosing an eco-audit methodology. Environmental audit procedures. Non-financial reporting as a means of communication with stakeholders.*	12
6	*Preparation for writing of Modular control work*	6
7	*Making Home control work*	10
8	*Preparation for the exam*	30
	Total	96

Individual assignments

Individual assignments are performed in the form of home control work (HCW) to consolidate and deepen the theoretical knowledge and practical skills acquired by students in the process of mastering the discipline's educational material. The topics of the HCW are assigned to students at the beginning of the course and are completed by them independently with the teacher's advice. The purpose of the individual work is to improve the ability to master the material independently, to master the practical skills of applying environmental management of the audit in practice, to form a system of environmental and audit views, approaches and knowledge in students, to increase the level of environmental awareness, thinking, ethics and environmental and legal culture.

The topics of individual assignments for the HCW are given in ch. 9.

Ensuring programme outcomes by parts of the educational component

Title of EC	*Lectures*	*Practical and laboratory classes, individual assignments*
To organize own work and the team work in the conditions of industrial production, project divisions, research laboratories, to determine goals and effective ways to achieve them, to motivate and train personnel.	*Lecture 3: Standardization of the environmental management system* *Lecture 4. Environmental policy* *Lecture 15. Public relations and open environmental reporting*	*Practical training 3. Environmental policy. Development of environmental policy.* *Practical training 4. Structures of environmental management at the enterprise.* *Practical training 5. Mechanisms and means of corporate environmental management.*
To develop and implement projects in the field of chemical technologies and related interdisciplinary projects taking into account social, economic, environmental and legal aspects.	*Lecture 9. Audit and certification of the environmental management system* *Lecture 16. Environmental audit as a component of environmental management* *Lecture 17. Organizational and legal aspects of environmental audit*	*Practical training 1: The concept of sustainable development of the world and the principles of environmental management.* *Practical training 2. Environmental management, its tools and tasks.*
To demonstrate awareness of the latest principles and	*Lecture 1. The essence of environmental management*	*Practical training 8. Non-financial environmental reporting.*

methods of environmental protection.	*Lecture 6. Implementation of environmental policy* *Lecture 7. Implementation and functioning of the environmental management system* *Lecture 8. Preparedness for emergency situations. Control and corrective actions* *Lecture 13. Eco-design* *Lecture 14. Ecological labelling* *Lecture 18. Environmental insurance in the environmental management system*	
To know up-to-date approaches to the organization of environmentally friendly productions, reorganization and reconstruction of existing productions from the standpoint of resource conservation.	*Lecture 2. Regulatory and legal basis of environmental management* *Lecture 5. Preliminary environmental analysis* *Lecture 10. Environmental management and waste management* *Lecture 11. Extended producer responsibility* *Lecture 12. Product life cycle analysis and LCA methodology*	*Practical training 6. Extended producer responsibility. Functional economics.* *Practical training 7. Elements of product life cycle analysis methodology.*

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 sists 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:

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

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

$$Rex = 50 \text{ points.}$$

The rating scale of the credit module is:

$$R = Rs + Rex = 50 + 50 = 100 \text{ points}$$

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 Rs 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 introducing an environmental management system.*
2. *Explain the relationship between environmental policy, goals and objectives.*

3. *Describe the types of environmental management systems at the enterprise.*
4. *Justify the main objectives of the preliminary environmental analysis.*
5. *The main regulatory legal acts of Ukraine in the field of nature management.*
6. *Describe the distinctive and common characteristics of corrective and preventive actions in the functioning of an environmental management system.*
7. *Specify the qualification criteria of an ecologist-auditor.*
8. *Describe the hierarchical structure of the waste management system.*
9. *Describe extended producer responsibility as a new approach to waste management.*
10. *List the risks and difficulties in the development of open environmental reporting.*
11. *Describe the procedure for granting ecolabels.*

An approximate list of questions for exam

1. *Formulate the essence and principles of environmental management.*
2. *Describe the objects and subjects of environmental management.*
3. *Explain the relationship between the concept of sustainable development and environmental management.*
4. *Describe the main elements of the environmental management system.*
5. *State the historical aspects of the emergence of environmental management.*
6. *Describe the purpose and tasks of environmental management at the enterprise.*
7. *Describe the possible structures of the environmental department at the enterprise.*
8. *Describe the functions of environmental management at the enterprise.*
9. *Explain the connection of the environmental management system with other enterprise management systems.*
10. *Explain the need for environmental licensing and certification.*
11. *Describe the types of documentation related to the environmental management system at the enterprise.*
12. *Describe the environmental policy of the enterprise.*
13. *Describe the process of developing the company's environmental policy.*
14. *Explain the relationship between environmental policy, environmental goals and objectives. Criteria for developing goals and objectives.*
15. *Reveal the difference in the planning of environmental goals and objectives in traditional enterprise management and in the implementation of an environmental management system.*
16. *Describe the essence, objectives, functions and features of the ISO 14000 series and EMAS standards.*
17. *Explain the stages of the process of drawing up environmental procedures.*
18. *Reveal the connection between the environmental goals, tasks and environmental aspects of the enterprise.*
19. *Describe the structure and distribution of responsibilities when implementing an environmental management system.*
20. *Describe the stages of implementation of the environmental management system at the enterprise.*
21. *Describe the classification of corrective actions in the environmental management system.*
22. *Describe the stages of SEM implementation that are key to implementing the concept of continuous improvement.*
23. *Explain the essence of monitoring in the environmental management system, its types and purpose.*
24. *Describe the main types of internal audit of the environmental management system, its purpose and tasks.*
25. *State the requirements for the auditor when conducting an environmental management system audit.*
26. *Describe the structure and content of the environmental management system audit report.*

27. *Explain the common difference in the concept of "non-compliance" in the implementation of EMS and in the certification audit of EMS.*
28. *Describe communications in the environmental management system.*
29. *Describe the concept of waste. Describe the main principles of economic regulation of the waste management system.*
30. *Reveal the essence of control and responsibility in the field of waste management.*
31. *Explain the place of waste management in the general system of environmental management at the enterprise.*
32. *Explain the concept of extended producer responsibility. List the types of producer responsibility.*
33. *Give examples of the use of extended producer responsibility in environmental policy.*
34. *List the main components of the life cycle analysis methodology.*
35. *List the areas of practical use of life cycle analysis and state the disadvantages of the life cycle analysis approach.*
36. *Explain the essence and importance of the task formulation stage for the subsequent life cycle analysis.*
37. *Describe the problem of the distribution of impacts during life cycle analysis and provide ways to solve it.*
38. *Describe eco-labelling programs. The purpose of environmental labeling.*
39. *Describe positive and negative environmental labeling. Types of ecological signs.*
40. *Explain the use of the life cycle analysis approach in ecolabelling.*
41. *Describe the types of public relations.*
42. *Describe the methods of external communication of the enterprise.*
43. *Explain the motivations for preparation and compare the methods of distribution of open environmental reporting.*
44. *Environmental report, its content, development, receipt, use and verification.*
45. *Describe the essence and causes of risks and difficulties in the development of open environmental reporting.*

An approximate list of questions for home control work

1. *Strategic environmental management.*
2. *Global environmental policy*
3. *Socio-economic motivation and consequences of implementing the environmental management system.*
4. *The role of environmental education and professional development of personnel in the development and spread of the environmental management system.*
5. *Innovative activity of the enterprise in the context of the implementation of the environmental management system.*
6. *Human, physical and financial resources for the implementation of environmental policy.*
7. *The system of environmental indicators of production and the determination of the effectiveness of environmental activities.*
8. *Environmental management as a component of the circular economy.*
9. *Environmental marketing as a component of environmental management.*
10. *The application of LCA to improve the environmental performance of the company.*

Syllabus of the course:

***Designed** by D.Sc, Associate Professor Oleksandr Khokhotva*

***Adopted** by Department of Ecology and Plant Polymers Technology (protocol № 17 dated 23.05.2024)*

***Approved** by the Methodology Board of the Faculty (protocol № 11 dated 28.06.2024)*