Syllabus

Course Program

Environmental Management

Specialty
101 – Ecology

Educational program
Engineering Ecology

Level of education
Master's level

Semester
2

Institute
Institute of Education and Science in Mechanical Engineering and Transport

Department
Department of Chemical Engineering and Environment Protection (154)

Course type
Special (professional), Mandatory

Language of instruction
English, Ukrainian

Lecturers and course developers

Olesia Filenko

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Candidate of Technical Sciences, Associated Professor

He has 20 years of experience. Author and co-author of more than 50 scientific and educational works.
Leading lecturer in the following disciplines: "Introduction to the specialty", "Environmental Impact Assessment and Strategic Environmental Assessment", "Environmental Control and Audit, Environmental Risk Management", "Environmental Management", "Eco-innovations in the creation of new technologies".
More about the lecturer on the department's website

General information

Summary

The discipline is aimed at mastering the knowledge of the theoretical foundations of managerial, technological, financial and economic measures aimed at reducing the environmental burden on the environment. The course deals with the application of theoretical provisions of environmental economics and environmental technologies - realization of the objective need to understand the cause-and-effect relationships between technogenesis and the state of environmental objects, determination of the patterns of human actions and the ecological state of the environment; obtaining mathematical models and hypotheses based on environmental monitoring data.

Course objectives and goals

The course introduces students to the subject and methods of environmental management, environmental audit, basic laws and their application to solving scientific and technical problems related to achieving the desired, possible and necessary state of the environment as an object of management; minimizing the likelihood of environmental crises and environmental disasters. The objectives of the discipline are to develop skills in calculating ecological balances - analysis of material and energy flows and cycles within the framework of the general concept of management; construction and use of models to display the entire set of relationships between resources and heterogeneous results of the production process.

Format of classes

Lectures, practical work, consultations. Report. The final control is an exam.

Competencies

GC-1. The ability to learn and master modern knowledge.
GC-2. The ability to make informed decisions.
GC-3. The ability to generate new ideas.
GC-7. Competence to motivate people and work towards a common goal.
SC-6. Ability to manage the strategic development of a team in the process of professional activity in the field of ecology, environmental protection, and balanced nature management.
SC-10. Ability to assess the level of negative impact of natural and anthropogenic factors of ecological danger on the environment and human.

Learning outcomes

RE-1. Know and understand the fundamental and applied aspects of environmental sciences.
RE-2. Be able to use conceptual ecological patterns in professional activities.
RE-5. Demonstrate the ability to organize collective activities and implement complex nature conservation projects, taking into account available resources and time constraints.
RE-9. Know the principles of personnel and resource management, basic approaches to decision-making under incomplete/insufficient information and conflicting requirements.
RE-14. Apply new approaches to develop decision-making strategies under complex unpredictable conditions.
RE-15. Evaluate environmental risks under conditions of insufficient information and conflicting requirements.
RE-16. Choose the optimal management and/or nature use strategy depending on environmental conditions

Student workload

The total volume of the course is 120 hours (4ECTS credits): lectures - 32 hours, practical studies - 16 hours, self-study - 72 hours

Course prerequisites

To successfully complete the course, you must have knowledge and practical skills in the disciplines "Innovative Entrepreneurship and Startup Project Management", "Environmental Principles of Country Sustainable Development", "Eco-innovations in the Development of New Technologies".

Features of the course, teaching and learning methods, and technologies

Lectures are conducted interactively with the use of multimedia technologies. Practical classes use reproductive and problem-solving teaching methods and focus on solving problems of assessing the state and factor loads based on cognitive modeling of system objects, problems of ecological and economic analysis using cognitive models and assessing the environmental safety of industrial production.

Program of the course

Topics of the lectures

Topic 1. Introduction
Basic methods and models of management systems for environmental management tasks
Topic 2. Methodological foundations of environmental management
Basic terminology. The concept of management, environmental protection, audit, environmental management and audit. Formulation of tasks of environmental and economic analysis.
Topic 3. Minimizing emissions and reducing environmental pollution
Tasks of reducing emissions at enterprises. Production quality management.
Topic 4. Pigou pollution tax and the market equilibrium condition under the Pareto optimum condition
Statement of the task. Solving problems of ecological and economic equilibrium according to the Pigou model.
Topic 5. Determination of the environmental penalty in accordance with Pareto-optimality.

Statement of the problem. Solving the problem of determining the amount of environmental fines and the conditions for their introduction.
Topic 6: Features of environmental requirements in a long-term equilibrium. Environmental tax on emissions.
Task statement. Determination of environmental requirements within the framework of economic development. Conditions for maintaining ecological and economic equilibrium.
Topic 7. Environmental requirements under emissions trading. Emission permit.
Setting the task. Models of economic efficiency in the emissions market. General content of the emission permit.
Topic 8. Models of environmental and economic state of production for the selection of efficient technology.
The concept of environmental technologies. Environmental and economic efficiency of production, environmental and economic balance.
Topic 9. Assessment of environmental safety of industrial production.
Environmental and economic risk. Risk analysis in terms of ecological production.
Topic 10. Tasks of organization and location of production taking into account the development of natural and territorial complexes.
The concept of natural and territorial complexes. Tasks of nature management and protection of natural ecological systems.
Topic 11. Dinkelbach's complex model of optimal resource allocation.
Conditions for the rational use of resources. Optimality of resource supply of production.
Topic 12: Optimal solutions to the ecological and economic problem according to the Dinkelbach model.
Topic 13. Main economic sanctions for resource use and emissions.
Buying and selling pollution rights.
Topic 14. Cognitive modeling for solving problems of managing weakly structured systems.
The concept of a weakly structured system. Cognitive models in environmental and economic analysis.
Topic 15. Tasks of assessing the state and factor loads based on cognitive modeling of system objects.
Construction of cognitive maps. Scenario approach to solving problems of ecological and economic analysis.
Topic 16. Examples of tasks of ecological and economic analysis using cognitive models.

Topics of the workshops

Topic 1: Introduction to the first-best and second-best methods. Data search, working with attribute tables of a topic.
Topic 2. Solving problems to determine the Pigou pollution tax
Topic 3. Environmental taxes, environmental insurance.
Topic 4. Optimality of resource supply of production - calculations by the complex Dinkelbach model.
Topic 5. Influence of environmental tools on decision-making in technology selection. Construction of diagrams, map layouts. Collection, accumulation, calculation, analysis of environmental and economic monitoring data and their statistical processing.
Topic 6. Principles of natural system development and sustainability of industrial ecological systems (IES). Case studies and their role in solving environmental problems.
Topic 7. Algorithm of resource allocation. Collection, accumulation, calculation, analysis of environmental and economic monitoring data and their statistical processing.
Topic 8: Building cognitive maps. Environmental safety under the condition of development of environmental loads.

Topics of the laboratory classes

Laboratory classes is not included in the course.

Self-study

The course includes an individual assignment (report). Students are also provided with additional materials to study independent topics and issues that are not covered in lecture classes.

Course materials and recommended reading

1. Environmental Management: Environmental Issues, Awareness and Abatement Paperback. 2021. 218 p. URL : https://www.amazon.in/Environmental-Management-Issues-Awareness-Abatement/dp/9811538158
2. Learn About Environmental Management Systems. URL : https://www.epa.gov/ems/learn-about-environmental-management-systems
A list of sources of information and materials formatted in accordance with the standards. It's possible to split the list into sections, e.g. Compulsory materials and Additional materials, etc.
3. Iyyanki V. Muralikrishna, Valli Manickam. EScience and Engineering for Industry. Book. 2017. 669 p. https://www.sciencedirect.com/book/9780128119891/environmental-management
4. Sevil Acar, Erinç Yeldan. Handbook of Green Economics. Book, 2020, Copyright © 2019 Elsevier Inc. All rights reserved. 189. p. https://doi.org/10.1016/C2018-0-00479-X
5. Shahjadi Hisan Farjana, Life Cycle Assessment for Sustainable Mining, Book, 2021, 172 p. https://doi.org/10.1016/C2020-0-01670-1
6. Jingzheng Ren, Sara Toniolo, Life Cycle Sustainability Assessment for Decision-Making Methodologies and Case Studies, Book, 2020, 344 p. https://doi.org/10.1016/C2018-0-02095-2
7. John Hill, Environmental, Social, and Governance (ESG) Investing A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio/ Book, 2020. 357 p. https://doi.org/10.1016/C2018-0-03866-9

Assessment and grading

Criteria for assessment of student performance, and the final score structure

100% of the final grade consists of the results of the examination (40%) and the current assessment (60%).
Examination: written assignment and oral response
Current assessment: practical work - 10%, essay - 10% and two current tests - 20% each.

Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.
Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/

Approval

Approved by

2023/08/31 Head of the department
Oleksii SHESTOPALOV

2023/08/31 Guarantor of the educational program
Musii TSEITLIN