ENVIRONMENTAL BALANCE AND IMPACT STUDIES

(Environmental Engineering, 4th Year of study, 1st Semester)

Credit value (ECTS): 4

Course category: Specialized discipline (mandatory)

Course holder: Assoc. prof. Raluca-Maria HLIHOR, PhD

Objectives of the discipline (course and practical activity)

The main objective of the course *Environmental balance and impact studies* is to provide knowledge of the methodology, techniques and specific methods for the development of environmental impact and environmental assessment studies, of the legal provisions on the procedure for the approval and authorization of anthropogenic activities with significant impacts on the environment and to develop the skills to assess the environmental impact and risk.

Contents (syllabus)

Course (chapters/subchapters)
1. Integrated pollution prevention and control
1.1. The need for integrated pollution prevention and control
1.2. The unsustainable modern economic system
1.3. Integrated pollution prevention and control
1.4. Sustainable development and circular economy
1.5. Pollution prevention in the context of sustainable development
1.6. Environmental Impact Assessment (EIA)
1.7. Integration of Circular Economy (CE) and Environmental Impact Assessment (EIA) concepts
2. Quality of environmental factors in impact assessments
2.1. Quality assessment of environmental factors (water, air, soil)
2.2. Types of impact assessments
3. Components of Environmental Impact Assessment
3.1. Environmental Impact Report (EIR)
3.2. Environmental Balance (EB)
3.3. Environmental Risk Assessment (ERA)
4. Environmental Impact Assessment
4.1. General aspects
4.2. Objectives
4.3. Stakeholders
4.4. Evolution of the EIA process
4.5. Environmental Impact Analysis
4.6. Regulatory framework for Environmental Impact Assessment at national and international level
4.7. Challenges of the EIA process
4.8. Public involvement in the EIA process
5. Types and scope of impacts analyzed in an EIA procedure
5.1. Identifying relevant problems and issues at the start of a project
5.2. Steps in building an EIA system
6. Steps in the EIA process
6.1. Project framing stage - Screening
6.2. Defining the field of evaluation - Scoping
6.3. Defining the field of evaluation and making the report on the environmental impact
7. Assessing environmental impacts using specific methods and techniques
7.1. General issues
7.2. Environmental impact assessment methodologies
7.3. Impact matrices
8. Environmental balance sheet - Definition and classification of balance sheet types

Practical activity
Assessing the environmental impacts of horticultural/agricultural or industrial activities 1. Rules for writing and setting the structure of the research topic Description and identification of the research topic, its importance, aim, objectives, materials and working method
2. Site description and identification of pollution sources and main contaminants for environmental components 2.1. Description of the technological process 2.2. Sources of pollution and contaminants for water, air and soil 2.3. Emission guide for each environmental category
3. Measuring environmental impacts using specific methods and techniques 3.1. The selection and description of an environmental impact assessment method 3.2. Applying the selected method for environmental impact assessment 3.3. Interpretation of results
4. Overview and evaluation

Bibliography

1. Bica I., 2004 - *Elemente de impact asupra mediului*, Ed. Matrix, București.
2. Gavrilescu M., 2008 - *Evaluarea și managementul riscului*, Ed. Politehnum, Iași.
3. Gavrilescu M. (Ed.), Crețescu I., Măluțan T., Puițel A., Smaranda C., Cozma P., Hlihor R.M., Ghinea C., Simion I.M., Comăniță E.D., Roșca M., Câmpean T., 2018 - *Strategii și soluții pentru eco-inovarea și eco-proiectarea unor procese și produse din materiale reciclabile în contextul economiei circulare*, Ed. Politehnium, Iași.
4. Ghiga S.C., Simion I.M., Filote C., Roșca M., Hlihor R.M., Cozma P., Gavrilescu M., 2023 - *Sources, composition and management strategies of waste electrical and electronic equipment: a review*, Environmental Engineering and Management Journal, 22(3), 509-526.
5. Hlihor R.M., Simion I.M., Filote C., Roșca M., Cozma P., Apostol M., Gavrilescu M., 2022 - *Exploatarea tehnologiilor prietenoase cu mediul în vederea îndepărtării poluanților persistenți din apele uzate,* Ed. "Ion Ionescu de la Brad", Iași.
6. Macoveanu M., 2003 - *Metode si tehnici de evaluare a impactului ecologic*, Ed. Ecozone, Iași.
7. Muntean. O.L., 2005 - *Evaluarea impactului antropic asupra mediului*, Ed. Casa Cărţii de Ştiinţă, Cluj-Napoca.
8. Nicu M., 2001 - *Bilanțuri de mediu*, Ed. Tehnică, Iași.
9. Pastakia C.M.R., Jensen A., 1998 - *The rapid impact assessment matrix (RIAM) for EIA*, Environmental Impact Assessment Revue, 18.
10. Robu B., 2010 - *Evaluări de mediu pentru dezvoltarea durabilă*, Ed. EcoZone, Iași.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Exam	Written examination	70%
Evaluation of the activity during the semester	Knowing the research topic, how to use specific instruments; assessment of instruments or achievements, processing and interpretation of results	30%

Contact

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ENVIRONMENTAL BALANCE AND IMPACT STUDIES

(Environmental Engineering, 4th Year of study, 2nd Semester)

Credit value (ECTS): 3

Course category: Specialized discipline (mandatory)

Course holder: Assoc. prof. Raluca-Maria HLIHOR, PhD

Objectives of the discipline (course and practical activity)

The main objective of the course *Environmental balance and impact studies* is to provide knowledge of the methodology, techniques and specific methods for the development of environmental impact and environmental assessment studies, of the legal provisions on the procedure for the approval and authorization of anthropogenic activities with significant impacts on the environment and to develop the skills to assess the environmental impact and risk.

Contents (syllabus)

Course (chapters/subchapters)
1. Life cycle assessment of processes and products
1.1. Introduction to Life Cycle Assessment (LCA)
1.2. Conceptual and methodological framework of LCA
1.3. Goal and scope definition
1.4. Life cycle inventory analysis
1.5. Impact assessment using life cycle assessment for processes and products
2. Environmental impact assessment during the removal of persistent pollutants from wastewater by environmentally friendly processes
3.1. Introduction
3.2. Methods used for environmental impact assessment of bioremediation processes used for persistent pollutants removal
3.3. Environmental impact assessment of bioremediation processes applied for persistent pollutants removal from wastewaters
3.4. Identifying and planning strategies for the integration of bioremediation processes in wastewater treatment systems in response to environmental impact assessments
3. Eco-innovation and eco-design of processes and products from recyclable materials in the context of the circular economy
3.1. Principles of eco-innovation and eco-design
3.2. Eco-innovation and eco-design for sustainable industrial production and for minimizing the environmental impacts
3.3. Indicators for measuring and evaluating eco-innovation and eco-design scenarios
3.4. Tools used for measuring the economic and environmental performance of eco-innovated and eco-designed processes and products: eco-label, environmental footprint, life-cycle assessment, cost-benefit analysis
4. Identifying impacts and risks to human health from the consumption of plant products with pesticide residues
4.1. Introduction - behavior of pesticides in the environment
4.2. Main routes of human exposure to pesticides
4.3. Impacts and risks of pesticides on human health
4.4. Human health impacts and risks assessment using the *impact pathway* model

Practical activity
1. Methods and techniques used in environmental impact assessment. Summary - *Global Pollution Index* Method

2. Environmental impact assessment methods applied in specific case studies: the *Interaction matrix* method (Leopold matrix) and the *rapid impact assessment matrix* (RIAM) method
3. Application of *Checklists* in identifying environmental impacts for a specific development project
4. Overview and evaluation

Project
Assessing the environmental impacts and risks of persistent pollutants in the environment 1. Rules for writing and setting the structure of the research topic Description and identification of the research topic, its importance, aim, objectives, materials and working method
2. Environmental impacts and risks assessment
3. Interpretation of results
4. Overview and evaluation

Bibliography

1. Bica I., 2004 - *Elemente de impact asupra mediului*, Ed. Matrix, București.
2. Fortună M.E., Simion I.M., Ghinea C., Petraru M., Cozma P., Apostol L.C., Hlihor R.M., Tudorache Fertu D., Gavrilescu M., 2012 - *Analysis and management of specific processes from environmental engineering and protection based on sustainability indicators,* Environmental Engineering and Management Journal, 11, 333-350.
3. Gavrilescu M., 2008 - Evaluarea și managementul riscului, Ed. Politehnum, Iași.
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9. Peiu N., 2004 – *Evaluarea ciclului de viață al produselor*, Ed. EcoZone, Iași.
10. Rojanschi V., 2008 - *Ghidul evaluatorului si auditorului de mediu*, Ed. Economica, București.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Exam	Written examination	70%
Evaluation of the activity during the semester	Knowing the research topic, how to use specific instruments; assessment of instruments or achievements, processing and interpretation of results	30%
Project	Knowledge of the theme and presentation of the project	100%

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