

Water and Soil Pollution (ENVIRONMENTAL ENGINEERING, 3rd YEAR OF STUDY, 5th SEMESTER)

Credit value (ECTS) 5

Course category

Mandatory

Course holder

Lecturer Raluca-Maria HLIHOR, Ph.D.

Discipline objectives (course and practical works)

The general objective of the discipline

Providing specialized information regarding the main pollutants affecting the quality of the water and soil, pollution sources and measures of pollution prevention and control, as well as remediation methods for the environmental factors involved.

Specific objectives of the discipline

Formation of the knowledge base necessary for understanding and operating with specific concepts in the field of water and soil pollution. The discipline also pursues the students' understanding of the short, medium and long term effects caused by pollution on human health and the environment.

Building students' abilities to identify, formulate and explain specific problems to the field of the discipline and to correctly interpret the results of the laboratory analyzes in order to propose efficient solutions for environmental sustainability.

Contents (syllabus)

Course (chapters/subchapters)
1. Water pollution 1.1. Water in the environment 1.2. Water pollution - general concepts 1.3. Water legislation 1.4. Types of water pollution 1.5. Sources of water pollution
2. Surface water and groundwater pollution 2.1. Introduction 2.2. Principles underlying water policy 2.3. Best Available Techniques 2.4. Pollution prevention and control – current practices 2.5. Pollution control legislation
3. Groundwater pollution 3.1. Groundwater pollution with wastewaters 3.2. Groundwater pollution with solid and semi-solid residues 3.3. Groundwater pollution with agricultural residues 3.4. Groundwater pollution from groundwater tanks
4. Surface water pollution 4.1. Sources of surface water pollution

<p>5. Water pollution by petroleum oils</p> <p>5.1. Sources of pollution, factors determining the quantity and quality of wastewaters</p> <p>5.2. Petroleum refinery wastewater characteristics</p> <p>5.3. Effects of oil impurification on water and aquatic organisms</p> <p>5.4. Pollution prevention and control</p>
<p>6. Water pollution with detergents</p> <p>6.1. Classification</p> <p>6.2. Sources of pollution</p> <p>6.3. Effect to organisms and environment</p> <p>6.4. Pollution prevention and control</p>
<p>7. Eutrophication and water pollution</p> <p>7.1. Eutrophying substances and their role to aquatic organisms</p> <p>7.2. Sources of pollution</p> <p>7.3. Consequences of eutrophication of surface waters</p> <p>7.4. Pollution prevention and control</p>
<p>8. Water pollution with pesticides</p> <p>8.1. Introduction</p> <p>8.2. Sources of water pollution with pesticides</p> <p>8.3. The action of pesticides in the aquatic environment</p> <p>8.4. Pollution prevention and control</p>
<p>9. Water pollution with nitrates</p> <p>9.1. Introduction</p> <p>9.2. Particularities of nitrate poisoning</p> <p>9.3. Sources of water pollution with nitrates</p> <p>9.4. Pollution prevention and control</p>
<p>10. Water pollution with polycyclic aromatic hydrocarbons (PAHs)</p> <p>10.1. Introduction</p> <p>10.2. Sources of water pollution with PAHs</p> <p>10.3. Pollution prevention and control</p>
<p>11. Water pollution with radionuclides</p> <p>11.1. Introduction</p> <p>11.2. Sources of water pollution with radionuclides</p> <p>11.3. Effects of radioactive contaminated water on the human body</p> <p>11.4. Pollution prevention and control</p>
<p>12. Water pollution with heavy metals</p> <p>12.1. Water pollution with lead. Sources of water pollution with lead</p> <p>12.2. Water pollution with mercury. Sources of water pollution with mercury water</p> <p>12.3. Water pollution with cadmium. Sources of water pollution with cadmium</p> <p>12.4. Water pollution with arsenic. Sources of water pollution with arsenic</p> <p>12.5. Effects on human health</p> <p>12.6. Pollution prevention and control</p>
<p>13. Water pollution with plastics</p> <p>13.1. Production and use of plastic products</p> <p>13.2. Plastics in the environment</p> <p>13.3. Impacts of the production and use of plastics in the environment</p> <p>13.4. Actions to reduce the impacts posed by the presence of plastics in the environment</p> <p>13.5. Pollution prevention and control</p>
<p>14. Thermal pollution of water</p> <p>14.1. Introduction</p> <p>14.2. Effects of thermal pollution on aquatic flora and fauna</p> <p>14.3. Pollution prevention and control</p>

15. Self-purification of surface water

15.1. Introduction

15.2. The main processes of self-purification of water

Practical works

1. General and specific instructions for work, health and safety - Applications in the laboratory

2. Sampling of water for laboratory analysis

2.1. Sample containers

2.2. Sampling mode

2.3. Samples preparation

2.4. Preservation

2.5. Transport

2.6. Identification

2.7. Results and discussion

3. Determining and calculating the pH value in aqueous solutions

3.1. Introduction

3.2. The principle of the method

3.3. Reagents and equipment

3.4. Methods

3.5. Results and discussion

3.6. Conclusions

4. Determination of phenol from aqueous solutions

4.1. Introduction

4.2. The principle of the method

4.3. Reagents and equipment

4.4. Methods

4.5. Results and discussion

4.6. Conclusions

5. Determination of Erythrosine B from aqueous solutions

5.1. Spectrophotometric determination of Erythrosine B - Principle of the method. Reagents and equipment. Methods. Results and discussion. Conclusions

5.2. Determination of the molar extinction coefficient of Erythrosine B - Principle of the method. Reagents and equipment. Methods. Results and discussion. Conclusions

6. Determination of cadmium from aqueous solutions

6.1. Introduction

6.2. The principle of the method

6.3. Reagents and equipment

6.4. Methods

6.5. Results and discussion

6.6. Conclusions

7. Determination of chromium from aqueous solutions

7.1. Spectrophotometric determination of hexavalent chromium with diphenylcarbazide - Principle of the method. Reagents and equipment. Methods. Results and discussion. Conclusions

7.2. Spectrophotometric determination of total chromium by trivalent chromium oxidation - Principle of the method. Reagents and equipment. Methods. Results and discussion. Conclusions

8. Recap. Final conclusions

9. Laboratory Colloquium

Bibliography

1. Bica I., 1998 - *Poluarea acviferelor. Tehnici de remediere*, HGA, București.

2. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009 - *Poluanți persistenți în mediu. I. Produse farmaceutice și de igienă*, Ed. Politehniun, Iași.

3. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009 - *Poluanți persistenți în mediu. II. Poluanți organici persistenți și coloranți*, Ed. Politehniun, Iași.
4. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009 - *Poluanți persistenți în mediu. III. Metale grele*, Ed. Politehniun, Iași.
5. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009 - *Poluanți persistenți în mediu. IV. Identificarea, estimarea și managementul integrat al riscurilor asociate impacturilor induse în mediu de poluanți organici persistenți și metale grele*, Ed. Politehniun, Iași.
6. Clesceri L.S., Greenberg A.E., Eaton A.D., 2005 - *Standard methods for the examination of water and wastewater*, 20th Edition, Franson M.A.H. (Ed.), American Public Health Association 1015 Fifteenth Street, NW, Washington DC 20005-2605.
7. Gavrilescu M., Nicu M., 2005 - *Reducerea poluanților la sursă și minimizarea deșeurilor - ediția a-II-a*, Ed. Ecozone, Iași.
8. Hlihor R.M., Simion I.M., 2016 - *Poluarea apei și solului: Îndrumar de laborator*, Ed. Ecozone, Iași.
9. Virsta A., 2012 - *Poluarea solului, apei și aerului*, Ed. Universității Lucian Blaga din Sibiu.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Course	Exam	70%
	Course attendance	10%
Practical works	Processing and interpreting the results; laboratory colloquium	20%

Contact

Lecturer Raluca-Maria HLIHOR, Ph.D.

Faculty of Horticulture - USAMV Iași

Aleea Mihail Sadoveanu nr. 3, Iași, 700490, Romania

E-mail: raluca.hlihor@uaiasi.ro

Water and Soil Pollution (ENVIRONMENTAL ENGINEERING, 3rd YEAR OF STUDY, 6th SEMESTER)

Credit value (ECTS) 4

Course category

Mandatory

Course holder

Lecturer Raluca-Maria HLIHOR, Ph.D.

Discipline objectives (course and practical works)

The general objective of the discipline

Providing specialized information regarding the main pollutants affecting the quality of the water and soil, pollution sources and measures of pollution prevention and control, as well as remediation methods for the environmental factors involved.

Specific objectives of the discipline

Formation of the knowledge base necessary for understanding and operating with specific concepts in the field of water and soil pollution. The discipline also pursues the students' understanding of the short, medium and long term effects caused by pollution on human health and the environment.

Building students' abilities to identify, formulate and explain specific problems to the field of the discipline and to correctly interpret the results of the laboratory analyzes in order to propose efficient solutions for environmental sustainability.

Contents (syllabus)

Course (chapters/subchapters)
1. Soil - a component of terrestrial ecosystems 1.1. Main features 1.2. Water distribution in soil 1.3. Soil problems 1.4. Classification of soils in terms of pollution
2. Soil pollution and degradation due to mining activities 2.1. Soil pollution and degradation by excavation 2.2. Soil pollution and degradation by covering with deposits and tailing ponds
3. Soil pollution and degradation by household and industrial waste 3.1. Solid waste management 3.2. Classification of solid waste 3.3 The effects generated by landfills on the environment and human health
4. Soil pollution and degradation by heavy metals 4.1. Introduction 4.2. Toxicity of heavy metals 4.3. Sources of soil pollution with heavy metals 4.4. Factors influencing the accessibility of heavy metals for plants 4.5. Factors influencing the mobility of heavy metals 4.6. Impact of heavy metals on the environment and human health 4.7. Legislation

5. Soil pollution and degradation by pesticides 5.1. Introduction 5.2. The main characteristics of pesticides 5.3. Pesticide management 5.4. Sources of soil pollution with pesticides 5.5. Factors influencing the persistence of pesticides in plants and soils 5.6. Impact of pesticides on the environment and human health
6. Soil pollution and degradation by airborne substances 6.1. Sources of airborne pollutants 6.2. Soil pollution and degradation with smoke, dust and ash
7. Soil pollution and degradation by radioactive substances 7.1. Characteristics of the main radioactive elements 7.2. Sources of radioactive pollution 7.3. The effect of radiation on soil properties
8. Soil pollution and degradation by solid and liquid wastes and residues from food and textile industry
9. Soil pollution and degradation by vegetable waste and agricultural and forestry residues
10. Soil pollution and degradation by animal and human waste
11. Soil pollution and degradation by erosion and landslides
12. Soil pollution and degradation by salinization 12.1. Introduction 12.2. Methods for the improvement of salted land
13. Soil pollution and degradation by acidification 13.1. The mechanism of soil acidification 13.2. Sources of soil degradation through acidification 13.3. The effects of soil acidification
14. Soil pollution and degradation by excessive moisture 14.1. Causes of excessive moisture 14.2. Effects of excessive water on soil quality 14.3. The influence of excessive water on the physical, chemical, biological properties of the soil 14.4. The influence of the excessive water on the agro technical characteristics of the soil
15. Soil pollution and degradation by excess or deficiency of nutrients
16. Soil pollution and degradation by coverage with sediments from erosion
17. Soil pollution and degradation by pathogen contaminants
18. Soil pollution by compaction, including crust formation 18.1. Causes of soil compaction and crust formation 18.2. Destruction of soil structure by compaction 18.3. The effects of secondary compaction
19. Complex soil pollution and degradation 19.1. Soil pollution and degradation through poor design, execution and exploitation of land improvement works 19.2. Soil degradation and pollution with oil and salt water
20. Standards of soil quality in Romania

Practical works
<p>1. Soil sampling for laboratory analysis</p> <p>1.1. Sampling containers 1.2. Weight of samples 1.3. Sampling mode 1.4. Preservation 1.5. Transport 1.6. Samples 1.7. Interpretation of results</p>
<p>2. Determination of soil conductivity</p> <p>2.1. Introduction 2.2. The principle of the method 2.3. Reagents and equipment 2.4. Methods 2.5. Results and discussion 2.6. Conclusions</p>
<p>3. Determination of soil pH</p> <p>3.1. Introduction 3.2. The principle of the method 3.3. Reagents and equipment 3.4. Methods 3.5. Results and discussion 3.6. Conclusions</p>
<p>4. Determination of total organic matter in soil</p> <p>4.1. Introduction 4.2. The principle of the method 4.3. Reagents and equipment 4.4. Methods 4.5. Results and discussion 4.6. Conclusions</p>
<p>5. Study of cadmium adsorption on soil</p> <p>5.1. Introduction 5.2. The principle of the method 5.3. Reagents and equipment 5.4. Methods 5.5. Results and discussion 5.6. Conclusions</p>
<p>6. Modeling of cadmium adsorption on soil</p> <p>6.1. Introduction 6.2. The principle of the method 6.3. Reagents and equipment 6.4. Methods 6.5. Results and discussion 6.6. Conclusions</p>
<p>7. Recap. Final conclusions</p>
<p>8. Laboratory Colloquium</p>

Bibliography

- 1. Blanco H., Rattan L., 2008** - *Principles of soil conservation and management*, Ed. Springer Science & Business Media, Kansas.
- 2. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009** - *Poluanți*

persistenți în mediu. I. Produse farmaceutice și de igienă, Ed. Politehniun, Iași.

3. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009 - *Poluanți persistenți în mediu. II. Poluanți organici persistenți și coloranți*, Ed. Politehniun, Iași.

4. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009 - *Poluanți persistenți în mediu. III. Metale grele*, Ed. Politehniun, Iași.

5. Căliman F.A., Robu B.M., Smaranda C., Pavel V.L., Gavrilescu M. (Ed.), 2009 - *Poluanți persistenți în mediu. IV. Identificarea, estimarea și managementul integrat al riscurilor asociate impacturilor induse în mediu de poluanți organici persistenți și metale grele*, Ed. Politehniun, Iași.

6. Gavrilescu M., Nicu M., 2005 - *Reducerea poluanților la sursă și minimizarea deșeurilor - ediția a-II-a*, Ed. Ecozone, Iași.

7. Konklin A., 2004 - *Field sampling. Principles and Practices in Environmental Analysis*, Marcel Dekker INC, New York, Basel.

8. Hlihor R.M., Simion I.M., 2016 - *Poluarea Apei și Solului: Îndrumar de Laborator*, Ed. Ecozone, Iași.

9. Virsta A., 2012a - *Poluarea solului, apei și aerului*, Ed. Universității Lucian Blaga din Sibiu.

10. Virsta A., 2012b - *Poluarea solului*, Valahia University Press, Târgoviște.

Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Course	Exam	70%
	Course attendance	10%
Practical works	Processing and interpreting the results; laboratory colloquium	20%

Contact

Lecturer Raluca-Maria HLIHOR, Ph.D.

Faculty of Horticulture - USAMV Iași

Aleea Mihail Sadoveanu nr. 3, Iași, 700490, Romania

E-mail: raluca.hlihor@uaiasi.ro