

SYLLABUS

1. Program data

1.1 Higher education institution	Babeş-Bolyai University Cluj-Napoca
1.2 Faculty	Environmental Science and Engineering
1.3 Department	Environmental Analysis and Engineering
1.4 Field of study	Environmental Engineering
1.5 Cycle of studies	License
1.6 Study Programme/Qualification	Environmental Engineering

2. Discipline data

2.1 Name of the discipline	Atmosphere protection technologies						
2.2 Course Activity Holder	Lecturer dr. ing. Horațiu Ștefănie						
2.3 Owner of laboratory activities	Lecturer dr. ing. Horațiu Ștefănie						
2.4 Year of study	III	2.5 Semester	5	2.6. Type of assessment	Ex	2.7 Discipline regime	compulsory

3. Total estimated time (hours per semester of teaching activities)

3.1 Number of hours per week	4	Of which: 3.2 course	2	3.3 Seminar/laboratory	2
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 Seminar/Laboratory	28
Time fund distribution:					Hours
Study by textbook, course material, bibliography and notes					15
Additional documentation in the library, on specialized electronic platforms and in the field					10
Preparation of seminars/laboratories, assignments, papers, portfolios and essays					13
Tutoring					2
Examination					2
Other activities:					-
3.7 Total individual study hours	42				
3.8 Total hours per semester	98				
3.9 Number of credits	5				

4. Preconditions (where applicable)

4.1 Curriculum	Fundamental knowledge of inorganic chemistry and atmospheric physics and chemistry
4.2 Competences	Not the case

5. Conditions (where applicable)

5.1 Course Conduct	Students will participate in at least 7 courses
5.2 Conduct of the seminar/laboratory	- Students will come to the laboratory with their mobile phones closed - Students will present themselves in the laboratory with a lab coat and laboratory/seminar notebook. Attendance at 12 activities out of the 14 is mandatory. - Students can receive the acceptance of the subject holder to recover only one practical laboratory work and only one seminar

6. Specific competences accumulated

Professional skills	- Analysis of technological processes and projects in order to reduce the impact on the environment - Elaboration of a report that includes the argumentation of the choice of a technology applied in environmental protection - Identification and application of technical solutions in solving problems related to environmental engineering - Identifying and specifying information related to the best available technologies in the field - Using information on the best technologies for implementation in environmental projects
Transversal competences	- Identifying and complying with the rules of ethics and professional deontology, assuming responsibility for the decisions taken and the related risks - Identifying roles and responsibilities in a multidisciplinary team and applying relationship techniques and effective work within the team - Efficient use of information sources and resources for communication and assisted professional training (portals, Internet, specialized software applications, databases, online courses, etc.) both in Romanian and in an international language - Description, analysis and use of concepts and theories in the fundamental scientific fields (mathematics, physics, chemistry) and in the field of engineering sciences - Description, analysis and use of concepts and theories in the economic-managerial field applied in the field of environment

7. Objectives of the discipline (resulting from the grid of accumulated skills)

7.1 General objective of the discipline	- Acquisition of theoretical knowledge regarding the problems raised by the presence of pollutants in the atmosphere and the methods used to prevent air pollution
7.2 Specific objectives	- To acquire theoretical knowledge regarding the problems raised by the presence of pollutants in the atmosphere. - Acquisition of theoretical knowledge regarding the methods used to prevent air pollution (technologies applied to mobile and stationary sources)

8. Contents

8.1 Course 2 hours/week	Teaching methods	Observations
8.1.1. Introduction. The composition of the atmosphere.	lecture, explanation, conversation	
8.1.2. Circulation of substances in the environment. Ozone layer Air pollution. Terminology.	lecture, explanation, conversation	
8.1.3. Migration of pollutants. Sources of pollution. The main air pollutants	lecture, explanation, conversation	
8.1.4. Effects of air pollution on humans, plants, animals.	lecture, explanation, conversation	
8.1.5. Measures to limit air pollution	lecture, explanation, conversation	
8.1.6. Methods for Reducing and Preventing Nitrogen Oxide Pollution.	lecture, explanation, conversation	
8.1.7. Methods for Reducing and Preventing Nitrogen Oxide Pollution (continued)	lecture, explanation, conversation	
8.1.8. Methods for reducing and preventing pollution with sulfur oxides (SO ₂ and SO ₃).	lecture, explanation, conversation	

8.1.9. Methods for Reducing and Preventing Sulphur Oxide Pollution (continued)	lecture, explanation, conversation	
8.1.10. Methods for reducing and preventing particulate matter (PM) pollution	lecture, explanation, conversation	
8.1.11. Methods for reducing and preventing carbon oxide pollution (CO and CO ₂)	lecture, explanation, conversation	
8.1.12. Methods for reducing and preventing pollution with volatile organic compounds (VOCs)	lecture, explanation, conversation	
8.1.13. Reduction of emissions due to mobile and fixed sources.	lecture, explanation, conversation	
8.1.14. Recapitulation. Exam preparation	lecture, explanation, conversation	

Bibliography

1. C. Rosu, *Technologies for the protection of the atmosphere and the prevention of air pollution* (course material)
2. N. Ajtai, *Technologies for the protection of the atmosphere and the prevention of air pollution* (course material)
3. C. Racocanu, E. C. Şchiopu, *Technologies for air protection and depollution*, Academica Brâncuşi Publishing House, Tg. Jiu, 2010.
4. M. Popescu, R. Popescu, C. Stratula, *Physico-chemical methods for the treatment of atmospheric industrial pollutants*, Romanian Academy Publishing House, Bucharest, 2006.
5. Gh. Iordache, *Methods and Equipment for the Prevention of Environmental Pollution*, Matrix Rom Publishing House, Bucharest, 2003.
6. Legislation specific to the protection of the atmosphere

8.2 Laboratory / seminar 2 hours/week	Teaching methods	Observations
8.2.1. Occupational safety and presentation of practical papers / seminars	Conversation	
8.2.2. Expression of the concentration of gaseous pollutants and conversion of units of measurement	conversation, learning by solving problems	T1 – each student will have to solve a personalized problem to solve
8.2.3. Methodology for active air sampling	experiment, conversation, learning through discovery	T2 –
8.2.4. Methodology for passive air sampling	experiment, conversation, learning through discovery	T3 –
8.2.5. Clean Air Act – major pollutants in the atmosphere; AQI – the methodology for calculating the air quality index	experiment, conversation, learning through discovery	T4 –
8.2.6. Active determination of PM ₁₀ and PM _{2.5} from air samples (outdoor and indoor)	Experiment, learning through discovery	FL1 – the work team consists of 4-5 students, each student in the team will have their own sampling point and experimental data (work is done in cycle)
8.2.7. Active determination of temperature, humidity, CO and CO ₂ from air samples (outdoor and indoor)	Experiment, learning through discovery	FL2 -
8.2.8. Active determination of ozone in air samples (outdoor and indoor)	Experiment, learning through discovery	FL3 –
8.2.9. Active determination of SO ₂ and NO ₂ from air samples (outdoor and indoor)	Experiment, learning through discovery	FL4 –

8.2.10. Determination of the air quality index for the sampling point at L1 → L4	conversation, learning by solving problems	T5 - each student will have to solve a personalized problem
8.2.11. Methodology for calculating the ventilation rate in a room (based on CO ₂)	conversation, learning by solving problems	T6 –
8.2.12. Passive determination of formaldehyde from air samples (outdoor and indoor)	conversation, learning by solving problems	T7 –
8.2.13. Recovery of a maximum of one practical paper and delivery of the 4 laboratory sheets FL1 → FL4 and the 7 assignments T1 → T7		
8.2.14. Laboratory Colloquium		
Bibliography		
Laboratory sheets – seminar / laboratory support, both in the laboratory and at the FSIM library.		

9. Corroborating the contents of the discipline with the expectations of the representatives of the epistemic community, professional associations and employers representative of the field related to the program

- Analysis of technological processes and projects in order to reduce the impact on the environment - Identification and application of technical solutions in solving problems related to environmental engineering
- Identifying and specifying information related to the best available technologies in the field
- Using information on the best technologies for implementation in environmental projects

10. Evaluation

Activity Type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight of the final grade
10.4 Course	Correctness of answers – correct acquisition and understanding of the issues dealt with in the course	Oral exam - access to the exam is conditioned by obtaining the grade in the laboratory (average of the 11 evaluated activities)	50 %
10.5 Laboratory	Correctness of answers – correct acquisition and understanding of the problems dealt with in the laboratory	Arithmetic average of the 11 activities performed (7 homework and 4 practical papers)	50 %
	Quality of lab sheets (FL1, → FL4)		
	Quality of homework completed (T1 → T7)		
10.6 Minimum Performance Standard			
- Grade 5 (five) both at the laboratory colloquium and at the exam according to the scale - Knowledge of the main pollutants of the atmosphere and their description - Knowledge of technologies for removing sulfur oxides and nitrogen oxides from the atmosphere			

Date of completion Signature of the course holder Signature of the seminar holder

05.12.2024

Date of approval in the department

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Signature of the department director

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