COURSE DESCRIPTION

Management, Treatment and Recovery of the Waste

Academic year 2025-2026

1. Programme-related data

1.1. Higher Education Institution	Babeș-Bolyai University Cluj Napoca
1.2. Faculty	Environmental Science and Engineering
1.3. Department	Department of Environmental Analysis and Engineering
1.4. Field	Environmental Engineering
1.5. Level of study	Master
1.6. Degree programme / Qualification	Sustainable development and environmental management
1.7. Form of education	Full-time education

2. Course-related data

2.1. Course title	**Management, Treatment and Recovery of the Waste**			Course code	**NME4321**
2.2. Course coordinator	Oana-Cristina Modoi				
2.3. Seminar coordinator	Oana-Cristina Modoi				
2.4. Year of study	1	2.5. Semester	1	2.6. Type of assessment	Exam
2.7. Course status	Compulsory			2.8. Course type	Core subject

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/ project	**2**
3.4. Total of hours in the curriculum	28	of which: 3.5. course	28	3.6. seminar/ laboratory	**28**
Time allocation for individual study (IS) and self-taught activities (ST)					**hours**
Learning from textbooks, course materials, bibliography, and notes (IS)					20
Additional research in the library, on subject-specific electronic platforms, and on-site					15
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					26
Tutoring (professional guidance)					2
Examinations					4
Other activities					2
3.7. Total hours of individual study (IS) and self-taught activities (ST)				**69**	
3.8. Total hours per semester				**125**	
3.9. Number of credits				**5**	

4. Prerequisites (where applicable)

4.1. curriculum-related	
4.2 skills-related	

5. Specific conditions (where applicable)

5.1. course-related	
5.2. seminar/laboratory-related	

6.1. Competencies resulting from the completion of the degree programme *(as referred to in the curriculum)*[1]

[1] The professional and/or transversal skills targeted by the subject for which the course description is prepared will be copied from the curriculum of the degree programme. For each competency, the complete entry, including the competency code, will be copied with the exact wording that appears in the curriculum, without any changes.

Professional competencies	
Competency code	**Competency**
PC1	Develop waste management processes
PC4	Advice on waste management procedures
PC5	Maintain waste collection records
PC7	Develop recycling programs
Transversal competencies	
Competency code	**Competency**
TC2	Collaborates in teams and networks
TC3	Uses digital devices and applications

6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)[2]

Learning outcomes targeted by the subject		
Competency code	**Knowledge and comprehension**	**Specific academic skills**
PC1	Master's student/graduate develops waste management processes	1.The student/graduate applies methods for the assessment, monitoring and management of the waste.
PC4, TC2	Master's student/graduate advises on waste management procedures	2.The student/graduate advises appropriate management procedures for various types of waste.
PC5, TC3	Master's student/graduate maintains waste collection records	3.The student/graduate performs waste collection records.
PC1, PC7	The student/graduate explains and correlates advanced concepts, theories, and methods related to integrated waste management, treatment technologies, recovery and disposal processes, as well as circular economy principles	4.The student/graduate designs, sizes, and optimizes waste management systems and procedures using modern technical tools and performance indicators
TC2	Master's student/graduate collaborates in teams and networks	5.The student/graduate demonstrates skills in coordination, planning, negotiation, empathy and assertive communication, leadership, teamwork, conflict management, project management, and other related competencies.
TC3	Master's student/graduate uses digital devices and applications	6.The student/graduate demonstrates abilities in use digital applications.

7. Subject-specific learning outcomes

Knowledge and comprehension
1. The student/graduate assumes responsibility for the implementation and improvement of waste management systems in complex organizational contexts, demonstrating professional autonomy.
2. The student/graduate acts ethically and responsibly in relation to stakeholders and coordinates legislative compliance activities.
3. The student/graduate coordinates operational activities and makes autonomous decisions to increase the efficiency of waste collection systems.

If no competency is copied from either of the two categories, the row corresponding to that category is deleted from the table.

[2] The learning outcomes relevant for the degree programme and targeted by the subject for which the course description is prepared will be listed. The entries, copied without any changes from the Curriculum by subject type (Core Subject/Specialisation Subject/Complementary Subject), are listed under the corresponding competency.

4. The student/graduate demonstrates intellectual autonomy and academic integrity in conducting research and disseminating results.
Specific academic skills
1. The student/graduate designs, sizes, and optimizes waste management systems and procedures using modern technical tools and performance indicators.
2. The student/graduate provides technical and legal-operational consultancy to organizations for the compliant implementation of waste management systems.
3. The student/graduate plans, monitors, and optimizes the collection and transport flows of waste and recyclable materials using digital tools.

8. Contents

8.1. Course	**Teaching and learning methods**	**Remarks[3]**
General. Definitions. Objectives Wastes classification	Lecture Interactive discussions Observations	
General principles of wastes management Collection and transportation of the wastes. Waste as unwanted material	Lecture Interactive discussions Observations	
Management of the biodegradable wastes. Landfill vs recovery & recycling. Emissions from landfills	Lecture Interactive discussions Observations	
Food waste as a sustainability issue.	Lecture Interactive discussions Observations	
Aerobic composting and anaerobic digestion of the biodegradable wastes.	Lecture Interactive discussions Observations	
Hazardous municipal waste. Biodiesel from used oil.	Lecture Interactive discussions Observations	
Waste-to-energy: Incineration. Hazardous waste incineration.	Lecture Interactive discussions Observations	
Other thermal treatments of the wastes: Co-incineration in the cement industry, Pyrolysis, Gasification.	Lecture Interactive discussions Observations	
Urban waste recovery and recycling: plastic, rubber.	Lecture Interactive discussions Observations	
Urban waste recovery and recycling: textile, leather.	Lecture Interactive discussions Observations	
Urban waste recovery and recycling: construction and demolition waste.	Lecture Interactive discussions Observations	

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[3] For example, organisational aspects, recommendations for students, specific aspects relating to the course/seminar, such as inviting experts in the field, etc.

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8.2. Seminar/ laboratory	Teaching and learning methods	Remarks
Waste classification. Strategic objectives and waste hierarchy	Group activities	
Smart collection. Waste as resources.	Group activities	
Consumption and waste at the community level. Waste reduction.	Group activities	
Emissions from waste. Landfill emission estimation. Emission mitigation.	Group activities	
Food waste management plan at the student campus. Upcycling food. Regulatory solution for waste.	Group activities	
Home/faculty/campus composting. Compost maturity. Essential parameters of compost assessment.	Group activities	
Anaerobic digestion. Biochemical methane potential.	Group activities	
Household hazardous waste. Sustainability evaluation of used oil collection and recovery	Group activities	
Performance of waste-to-energy systems. Flue gas treatment. Hazardous waste incineration: Case study	Group activities	
Urban plastic waste flow analysis. Upcycling & downcycling. Chemical recycling vs mechanical recycling.	Group activities	
Policy regulation. Fast-fashion. Collection and sorting system design.	Group activities	
Separate collection. Recycling aggregates. Demolition plan for an industrial site - case study.	Group activities	

Bibliography

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9. Evaluation

Type of activity	9.1 Evaluation criteria[4]	9.2 Evaluation methods[5]	9.3 Percentage in the final grade
9.4. Course	Level of conceptual understanding.	Written exam	50%
	Analytical skills		
	Quality of argumentation		
9.5. Seminar/ laboratory	Applying knowledge in practical contexts	Case studies	30%
	Quality of argumentation	Active participation	20%
9.6 Minimum standard for passing			
...			

10. SDG labels (Sustainable Development Goals)[6]

	○	Sustainable Development Generic Label

12 CONSUM ȘI PRODUCȚIE RESPONSABILE								
○	○	○	○	○	○	○	○	○

Date of entry:
April, 2026

Signature of course coordinator

Cristina Modoi, PhD

Signature of seminar coordinator

Cristina Modoi, PhD

Date of approval in the department:
...

Signature of the head of department

.....

[4] The evaluation criteria must directly reflect the learning outcomes targeted at the level of the degree programme respectively at the level of the subject. More specifically, the learning outcomes set out in the expected learning outcomes are assessed.

[5] Both final evaluation methods and ongoing evaluation strategies should be established.

[6] Select a single label which, according to the *Implementation of SDG labels in the academic process*, best matches the subject. If the subject addresses sustainable development in a generic manner (i.e. by presenting/introducing the general framework of sustainable development, etc.), then the Sustainable Development generic label may be applied. If none of the labels describe the subject, select the last option: *"No label applies."*