SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babes Bolyai University Cluj-Napoca**
1.2 Faculty	**Environmental Sciences and Engineering**
1.3 Department	**Department of Analysis and Environmental Engineering**
1.4 Field of study	**Environmental Engineering**
1.5 Study cycle	**Master**
1.6 Study programme / Qualification	**Sustainable Development and Environmental Management**

2. Information regarding the discipline

2.1 Name of the discipline	**Management, Treatment and Recovery of the Waste**						
2.2 Course coordinator	Lect. eng. Cristina Modoi, PhD						
2.3 Seminar coordinator	Lect. eng. Cristina Modoi, PhD						
2.4. Year of study	**2**	2.5 Semester	**3**	2.6. Type of evaluation	Exam	2.7 Type of discipline	Mandatory

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	3	Of which: 3.2 course	1	3.3 seminar/laboratory	1/1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	14	3.6 seminar/laboratory	14/14
Time allotment:**104**					hours
Learning using manual, course support, bibliography, course notes					14
Additional documentation (in libraries, on electronic platforms, field documentation)					18
Preparation for seminars/labs, homework, papers, portfolios and essays					18
Tutorship					10
Evaluations					2
Other activities:					-

3.7 Total individual study hours	62
3.8 Total hours per semester	42
3.9 Number of ECTS credits	5

4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	

5. Conditions (if necessary)

5.1. for the course	Laptop, video system
5.2. for the seminar /lab	Laptop, video system

activities	

6. Specific competencies acquired

Professional competencies	Municipal waste management concepts General principles of the waste management Waste recovery and recycling Energy recovery from the waste
Transversal competencies	Analyzing, assessing and structuring the processes of collection, transport, treatment, recovery, recycling, composting and disposal of waste in order to reduce the environmental impact.

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	Acquire the theoretical and practical knowledge in the field of waste management; Knowledge about waste collection, transport, treatment, recovery, recycling, and landfills
7.2 Specific objective of the discipline	Analysis of the urban waste management process Reduce the environmental impact of the municipal solid waste The emphasis on the importance of efficient waste management in industry and in other economic branches

8. Content

8.1 Course	Teaching methods	Remarks
General. Definitions. Objectives Wastes classification	Lecture Interactive discussions Observations	
General principles of wastes management Collection and transportation of the wastes Health-care wastes management	Lecture Interactive discussions Observations	
Management of the biodegradable wastes. Landfill vs recovery & recycling	Lecture Interactive discussions Observations	
Aerobic and anaerobic composting of the biodegradable wastes.	Lecture Interactive discussions Observations	
Biodiesel from used oil. Paper recycling	Lecture Interactive discussions Observations	
Other wastes recovery and recycling: plastic, rubber, leather	Lecture Interactive discussions Observations	
Recycling of the construction and demolition wastes	Lecture Interactive discussions Observations	

Waste Electrical and Electronic Equipment	Lecture Interactive discussions Observations	
Hazardous wastes in the municipal solid wastes. Health-care wastes	Lecture Interactive discussions Observations	
Thermal treatments of the wastes: Pyrolisis, Gasification, Incineration. Coincineration in the cement industry.	Lecture Interactive discussions Observations	
Industrial wastes management. Hazardous wastes.	Lecture Interactive discussions Observations	

Bibliography

1. 1. Williams, Paul T., 2005, Waste treatment and disposal, 2nd edition, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, England, ISBN 0-470-84912-6, 380 p.
2. European Environmental Agency Report, 2013, Managing municipal solid waste — a review of achievements in 32 European countries
3. Larry Bass, T. E. Bilderback, Extension Specialist, M. A. Powell, Composting, a guide to managing organic yard wastes, Published by North Carolina Cooperative Extension Service
4. Manderson , G.J., Composting agricultural and industrial wastes, Biotechnology , vol III, Encyclopedia of Life Support Systems
5. Environment Canada, 2013, Technical Document on Municipal Solid Waste Organics Processing, ISBN: 978-1-100-21707-9.
6. Pichtel, John,2005, Waste management practices : municipal, hazardous, and industrial / John Pichtel, ISBN 0-8493-3525-6, Taylor & Francis Group, 649 p.
7. European Directive
8. Blasy L., Lange M., Hagen N., Rosar D., Atudorei A., *Benefits of using landfill gas resulting from municipal landfill, Salubrity*, 2006.
9. Lottermoser, B., 2003, Mine wastes: Characterization, Treatment and Environmental Impacts, Springer Verlag - Berlin, Heidelberg
10. Woodard & Curran, Inc., 2006, Industrial Waste Treatment Handbook Second Edition, Elsevier

8.2 Seminar / laboratory	Teaching methods	Remarks
Seminar 1: Analysis of waste management process	Group activities	2 hours
Seminar 2: Analysis of process biodegradable waste management	Group activities	2 hours
Seminar 3: Analysis of process solid waste management: metal and paper wastes	Group activities	2 hours
Seminar 4: Analysis of process solid waste management: glass and plastics wastes	Group activities	2 hours
Seminar 5: Analysis of process solid waste management: rubber and textile wastes	Group activities	2 hours
Seminar 6: Analysis of industrial waste management process, including hazardous wastes	Group activities	2 hours

Bibliography

1. Paul T.W., *Waste Treatment and Disposal*, cap. 4 – Waste Landfill, Second Edition, Ed. John Wiley & Sons, ISBN: 0-470-84912-6, 2005. Rusu T., Bejan M., *Deşeul sursă de venit*, Editura Mediamira, Cluj-Napoca, ISBN 973-713-119-3, 2006.
2. References document of best available techniques (BAT, 2009) of Final Draft BAT Guidance Note on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities
3. Draft of References document of best available techniques (BAT) of Waste Treatments Industries, 2015

4. Guidance for the Recovery and Disposal of Hazardous and Non-hazardous Waste, IPPC, 2004
5. Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste
6. US EPA - Methodology for Estimating Municipal Solid Waste Recycling Benefits, 2007
7. Tchobanoglous G., Kreith F., *Handbook of Solid Waste Management*, McGraw-Hill, New York, 2002.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

Linking national legislation with EU law transposition of the Directive CE98/2008 into Law 211/2011, under which each company must appoint a person responsible for waste management under new European environmental principles

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Presence		
	Activity	Written exam and theoretical questions.	Exam (Note E) 50%
			Project (Note P) 25%
10.5 Seminar/lab activities	Presence		
	Activity	Problem solving	Seminar (Note S) 25%
10.6 Minimum performance standards: N=0,5E+0,25S+0,25P; N>5; S>5; P>5			

Date	Signature of course coordinator	Signature of seminar coordinator
Mai 2018	Lect.dr.ing. Cristina Modoi	Lect.dr.ing. Cristina Modoi


Date of approval

Signature of the head of department