

## SYLLABUS

### 1. Information regarding the programme

1.1 Higher education institution	<b>Babeş-Bolyai University of Cluj-Napoca</b>
1.2 Faculty	<b>Faculty of Environmental Science and Engineering</b>
1.3 Department	<b>Department of Environmental Analysis and Engineering</b>
1.4 Field of study	<b>Risk Assessment and Environmental Security</b>
1.5 Study cycle	<b>Master</b>
1.6 Study programme / Qualification	<b>Environmental Management and Sustainable Development/ Master degree</b>

### 2. Information regarding the discipline

2.1 Name of the discipline	<b>NME8212 INTEGRATED MANAGEMENT OF WATER RESOURCES AND PROCEDURES FOR WASTEWATER TREATMENT</b>						
2.2 Course coordinator	<b>Associate professor PhD Radu Mihăiescu</b>						
2.3 Seminar coordinator	<b>Associate professor PhD Radu Mihăiescu</b>						
2.4. Year of study	<b>1</b>	2.5 Semester	<b>2</b>	2.6. Type of evaluation	<b>E</b>	2.7 Type of discipline	<b>DA</b>

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

3.1 Hours per week	3	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 allotment:	hours				
Learning using manual, course support, bibliography, course notes	20				
Additional documentation (in libraries, on electronic platforms, field documentation)	20				
Preparation for seminars/labs, homework, papers, portfolios and essays	20				
Tutorship	5				
Evaluations	4				
Other activities: .....	-				
3.7 Total individual study hours	69				
3.8 Total hours per semester	125				
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	Video projector
5.2. for the seminar /lab activities	Laboratory with computers;

## 6. Specific competencies acquired

<b>Professional competencies</b>	<ul style="list-style-type: none"> <li>• Explain the concept and principles of Integrated Water Resource Management (IWRM)</li> <li>• Describe the methodologies and tools for practicing IWRM</li> <li>• Analyze the EU WFD as an example of IWRM in practice</li> <li>• Work with integrated water management projects and get a fair insight in in the EU WFD</li> <li>• Describe different methods for wastewater treatment and environmental effects of wastewater</li> <li>• apply methods from mathematical modelling to describe different waste water treatment processes</li> <li>• apply simulation tools for waste water treatment, and to interpret and evaluate the results</li> <li>• grasp the microbiological processes in the activated sludge process</li> <li>• account for how automatic control is used to optimise the waste water treatment</li> </ul>
<b>Transversal competencies</b>	<ul style="list-style-type: none"> <li>• Autonomy and responsibility.</li> <li>• Relational attitude and open, honest, cooperative, responsive communication.</li> <li>• Analysis and interpretation availability of values that describe a situation, event or behavior.</li> <li>• Foster imagination, willingness to conduct self in relation to others based on empathy and receives messages with emotional content.</li> <li>• Acceptance evaluation from others.</li> <li>• moral integrity, balance of character, and strength of conviction critical in promoting positive values authentic social community</li> </ul>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>• The course gives insights in the theoretical and methodological elements underlying the notion of ‘integrated water resources management’ (IWRM), with focus on concepts and tools for sustainable planning and management of water resources.</li> <li>• To introduce the problem-solving concepts and tools commonly used in environmental engineering,</li> <li>• To present the fundamental operations and processes that are used in environmental engineering, with a focus on water and wastewater treatment processes.</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>• To provide a broad background on the occurrence, use, management, and conservation of water and water resources.</li> <li>• To understand physical hydrology and the hydrologic basis of water resources. Explain what wastewater is and describe how it is characterized.</li> <li>• Describe the objectives and importance of (i) physical treatment, (ii) biological treatment, and (iii) chemical treatment in the handling of municipal wastewater. Students will be able to analyze wastewater data and develop a preliminary design of the primary, secondary, advanced, and sludge treatment processes for a wastewater treatment plant.</li> </ul>

## 8. Content

8.1 Course	Teaching methods	Remarks
1. Water cycle. Water distribution on Earth. Natural characteristics of surface and underground water.	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> </ul>	
2. Role of natural factors in defining watershed evolution. Natural and human induced changes.	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> </ul>	

3. The necessity of integrated water management. History of water management. Concepts and theoretical perspectives on IWRM. Principles, methodologies & tools for practising IWRM	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
4. Water Framework Directive	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
5. Assessing pressures and impacts on water bodies. Water monitoring	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
6. Hazardous chemical pollutants. Eutrophication of water bodies	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
7. The role of wetlands in integrated water resource management.	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
8. Renaturation of watercourses	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
9. River basin management in the context of climate change	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
10. Coastal water management. The Seas Directive.	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
11. Wastewater treatment. General aspects. Primary Treatment.	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
12. Secondary Treatment (biologic treatment).	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
13. Tertiary Treatment (Nutrient Removal). Nitrification / Denitrification Phosphorus Removal	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	
14. Sludge Treatment and Disposal.	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	

### **Bibliography**

1. Davis, Mackenzie L., 2010, Water and wastewater engineering: design principles and practice. Mackenzie L. Davis. professional edition: New York: McGraw-Hill
2. Edzwald, J.K., 2011, Water Quality & Treatment. A Handbook on Drinking Water, Sixth Edition, ISBN: 978-0-07-163010-8, McGraw-Hill
3. Loucks, D.P., van Beek, E., 2005, Water Resources Systems Planning and Management An Introduction to Methods, Models and Applications, ISBN 92-3-103998-9, UNESCO
4. Mihăiescu, R., 2020, Integrated management of water resources and procedures for wastewater treatment, lecture notes.
5. Robescu, D., Szabolcs, L., Robescu, Diana, Verestoy, A., 2004, Wastewater treatment technologies, installations and equipments. Ed. Tehnică, București.
6. <http://unesdoc.unesco.org/images/0018/001818/181891E.pdf>
7. <http://www.un.org/waterforlifedecade/iwrm.shtml>

8. <a href="http://www.unece.org/fileadmin/DAM/env/water/publications/NPD_IWRM_study/ECE_MP.WAT_4_4_en.pdf">http://www.unece.org/fileadmin/DAM/env/water/publications/NPD_IWRM_study/ECE_MP.WAT_4_4_en.pdf</a>		
9. <a href="http://www.unwater.org/downloads/GWP-INBOHandbookForIWRMinBasins.pdf">http://www.unwater.org/downloads/GWP-INBOHandbookForIWRMinBasins.pdf</a>		
8.2 Seminar / laboratory	Teaching methods	Remarks
1. Analysis of factors that shape the nature of watersheds	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Brainstorming</li> </ul>	
2. Natural and human induced changes	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Brainstorming</li> </ul>	
3. Rehabilitation of water courses	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Brainstorming</li> </ul>	
4. Criteria of water monitoring, assessment and management according to WFD	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Brainstorming</li> </ul>	
5. Watershed management plan. Study cases Romania	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Brainstorming</li> </ul>	
6. Field trip to WWTP Cluj-Napoca.	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> </ul>	
7. Discussion of case studies. Powerpoint presentations and essays.	<ul style="list-style-type: none"> <li>• Lab assignment</li> <li>• thematic analysis</li> </ul>	
<b>Bibliography</b>		
10. Edzwald, J.K., 2011, Water Quality & Treatment. A Handbook on Drinking Water, Sixth Edition, ISBN: 978-0-07-163010-8, McGraw-Hill		
11. Loucks, D.P., van Beek, E., 2005, Water Resources Systems Planning and Management An Introduction to Methods, Models and Applications, ISBN 92-3-103998-9, UNESCO.		
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13. Robescu, D., Szabolcs, L., Robescu, Diana, Verestoy, A., 2004, Wastewater treatment technologies, installations and equipments. Ed. Tehnică, București.		
14. <a href="http://unesdoc.unesco.org/images/0018/001818/181891E.pdf">http://unesdoc.unesco.org/images/0018/001818/181891E.pdf</a>		
15. <a href="http://www.un.org/waterforlifedecade/iwrn.shtml">http://www.un.org/waterforlifedecade/iwrn.shtml</a>		
16. <a href="http://www.unece.org/fileadmin/DAM/env/water/publications/NPD_IWRM_study/ECE_MP.WAT_4_4_en.pdf">http://www.unece.org/fileadmin/DAM/env/water/publications/NPD_IWRM_study/ECE_MP.WAT_4_4_en.pdf</a>		
17. <a href="http://www.unwater.org/downloads/GWP-INBOHandbookForIWRMinBasins.pdf">http://www.unwater.org/downloads/GWP-INBOHandbookForIWRMinBasins.pdf</a>		

**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**

The content structure of the discipline was structured by studying the recent monographs in the field and by consulting the programs and the available notes from some recognized institutions in the field.

**10. Evaluation**

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	<ul style="list-style-type: none"> <li>• The correctness and completeness of the accumulated knowledge.</li> </ul>	Oral exam	75%
10.5 Seminar/lab activities	<ul style="list-style-type: none"> <li>• Project/ essay</li> </ul>	Evaluation of the project (documentation and demonstration)	25%

### 10.6 Minimum performance standards

Each student has to prove that (s)he acquired an acceptable level of knowledge and understanding of the:

- Determinants of the quantity and quality of water resources.
- The principles of integrated water resource management.
- Identification and classification of different wastewater sources and their treatment requirements based on their discharge or final use.

The student will prepare and sustain a project / essay according to the content of the framework.

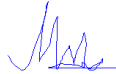
Obtaining the minimum mark of 5 is an entry condition for the Exam.

Date

22.03.2021

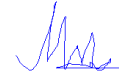
Signature of course coordinator

Associate professor PhD Radu Mihaiescu



Signature of seminar coordinator

Associate professor PhD Radu Mihaiescu



Date of approval

Signature of the head of department  
Associate professor PhD Radu Mihaiescu

