SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeş-Bolyai University of Cluj-Napoca**
1.2 Faculty	**Environmental Science and Engineering**
1.3 Department	**Environmental Analysis and Assessment**
1.4 Field of study	**Environmental Engineering**
1.5 Study cycle	**Bachelor**
1.6 Study programme / Qualification	**Environmental Engineering**

2. Information regarding the discipline

2.1 Name of the discipline		**NSM1221 Ecology and Ecological Management**					
2.2 Course coordinator		Univ. lect Eliana Sevianu, PhD					
2.3 Seminar coordinator		Univ. lect Eliana Sevianu, Phd					
2.4. Year of study	**II**	2.5 Semester	**III**	2.6. Type of evaluation	**E**	2.7 Type of discipline	Obl.

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

3.1 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 allotment:					hours
Learning using manual, course support, bibliography, course notes					20
Additional documentation (in libraries, on electronic platforms, field documentation)					30
Preparation for seminars/labs, homework, papers, portfolios and essays					8
Tutorship					8
Evaluations					4
Other activities:					

3.7 Total individual study hours	70
3.8 Total hours per semester	126
3.9 Number of ECTS credits	5

4. Prerequisites (if necessary)

4.1. curriculum	The knowledge acquired through the in-depth study of the content taught in environmental disciplines facilitates the understanding and accessibility of the proposed topics and concepts.
4.2. competencies	The continuity of the practical application of acquired knowledge allows for a gradual progression through the chapters, in relation to the topics of previously studied disciplines.

5. Conditions (if necessary)

5.1. for the course	Course room equipped with a whiteboard, video projector, and laptop.
5.2. for the seminar /lab activities	Laboratory equipped with a video projector, laptop, and specific equipment.

6. Specific competencies acquired

Professional competencies	• Knowledge and appropriate use of specific terms of the discipline, basic concepts, understanding the importance of ecology, practical value, and the interdisciplinarity of the field. • Acquiring the ability to understand the concepts, phenomena, processes, and content of the discipline. • Developing the ability to interpret and synthesize information, ideas, ecological phenomena, and processes. • Acquiring practical skills (using, designing an ecology study, applying specific study methods, techniques, and equipment, and interpreting results). • Developing skills in applying and transferring knowledge to solve domain-specific problems. • Demonstrating a positive and responsible attitude towards the living world, in the fields of ecology, environmental protection, and sustainable development. • Using creativity and innovation in interpreting ecological processes and solving specific problems.
Transversal competencies	• Critical thinking and synthesis ability • Autonomy and responsibility • Teamwork skills • Effective use of informational resources, individual and group research in English language

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

7.1 General objective of the discipline	• Understanding the relationships established between living organisms and between them and their environment and applying this knowledge in the ecological management of natural resources.
7.2 Specific objective of the discipline	• Understanding and knowledge of the elements and functions of community and ecological systems • Understanding processes and interactions at the individual, population, community, and ecosystem levels • Developing practical skills in conducting ecological studies • Understanding the mechanisms underlying ecological management and acquiring theoretical knowledge and practical skills for the ecological management of natural resources and biodiversity • Understanding natural and anthropogenic phenomena that lead to the degradation of natural ecosystems and, consequently, the need for an ecological management system.

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction. Defining the object of study of ecology. Branches of ecology: autecology, demecology, and synecology. Ecological management, objectives, and applicability.	Free, interactive presentation with PowerPoint/Prezi visualization support; thematic films, discovery-based learning, group discussions.	

2. The evolution and diversity of the living world. Concepts of genetics and natural selection. Implications for the management and conservation of wild populations.	Free, interactive presentation with PowerPoint visualization support; problem-solving situations. Case study.	
3. Adaptation to the environment. Abiotic and biotic factors influencing natural populations. Limiting factors in species distribution.	Free, interactive presentation with PowerPoint visualization support. Discovery-based learning using thematic films.	
4. Size and density of natural populations. Regulation of population size. Population dynamics. Demographic strategies.	Free, interactive presentation with PowerPoint visualization support; individual exercise. Case study.	
5. Population structure. Age structure, sexual structure, spatial structure.	Free, interactive presentation with PowerPoint visualization support; thematic discussions, group debate.	
6. Intraspecific social relationships and spatial distribution.	Free, interactive presentation with PowerPoint visualization support. Discovery-based learning using thematic films.	
7. Limiting factors in species distribution. Vulnerability to extinction and the management of vulnerable natural populations.	Free, interactive presentation with PowerPoint visualization support. Discovery-based learning using thematic films. Case study.	
8. Ecology of communities. Species abundance and diversity. Ecosystem structure and types of interactions.	Free, interactive presentation with PowerPoint visualization support. Thematic discussions.	
9. Ecological niche. The concept of ecological niche. Fundamental niche and realized niche. Trophic relationships.	Free, interactive presentation with PowerPoint visualization support. Thematic discussions.	
10. Interspecific relationships I. Competition and predation. Implications for the management of natural populations.	Free, interactive presentation with PowerPoint visualization support. Discovery-based learning using thematic images. Case study.	
11. Interspecific relationships II. Parasitism, amensalism, commensalism, mutualism. Implications for the management of natural populations.	Free, interactive presentation with PowerPoint visualization support. Discovery-based	

	learning using thematic films. Case study.	
12. Management of natural ecosystems. Conservation status of habitats and protected species. Pressures and threats to habitats and species. Introduced and invasive species in natural ecosystems. Effects and management measures.	Free, interactive presentation with PowerPoint visualization support. Problem-solving situations. Debate.	
13. Management of natural ecosystems. Ecological succession and ecosystem stability. Primary succession and secondary succession. Climate change.	Free, interactive presentation with PowerPoint visualization support. Debate. Case study.	
14. Ecological management. Harmonizing environmental interests with economic ones. The social dimension of ecological management.	Free, interactive presentation with PowerPoint visualization support. Discovery-based learning and problem-solving.	

Bibliography:

1. Begon, M., Harper, L., Townsend, C. 2021. Ecology. Individuals, Populations, Communities. Blackwell Scientific Publications
2. Bowman, W. Hacker, S. 2023. Ecology. Oxford University Press
3. Farina, A. 1998. Principles and methods in landscape ecology. Chapman& Hall.
4. Futuyma, D. 2005. Evolution. Sinauer Associates, U.S.A.
5. James, P. and Douglas, I. 2023. Urban Ecology. Taylor & Francis LTD.
6. Lame, M., & Marcantonio, R. 2022. Environmental Management: Concepts and Practical Skills. Cambridge: Cambridge University Press.
7. Mallen-Cooper M. and Zampatti B.P. 2018. History, hydrology and hydraulics: Rethinking the ecological management of large rivers. Ecohydrology, 11(5): e1965.
8. Molles, M. 2015. Ecology: Concepts and Applications. McGraw Hill.
9. Singer, F. 2024. Ecology in action. Cambridge University Press
10. Stojanovic, M. 2019. Conceptualization of ecological management: practice, frameworks and philosophy. J Agric Environ Ethics 32(3):431–446

8.2 Seminar / laboratory	Teaching methods	Remarks
Principles of Ecological Research: Aims, objectives. Types of research. Stages of an ecological study. Introduction of terms and specific notions related to practical field and laboratory applications.	The lecture, explanation, heuristic conversation, demonstration, exercise.	
General Methods for Practical Study in Ecology: Ecological sampling. Theoretical aspects, methods, types, design, equipment, and devices. General methods for data collection.	Explanation, heuristic conversation, demonstration, case study, problem-solving, discovery learning.	Familiarization with the equipment and specific devices
Planning an Ecological Study, Sampling Methods: Practical application: estimating the population size, density, and frequency of herbaceous plant species using the quadrat method, with randomized selection of sample areas.	Explanation, demonstration, case study, exercise, problem-solving, experiment.	
Size of Natural Populations: Identification of species and evaluation of population sizes in bat species adapted to urban environments.	Explanation, demonstration, discovery learning, and practical application.	Practical field trip

Spatial Model of Population Distribution in Plants and Animals: Methods and techniques for field identification. Evaluating tree species' density using the distance method Practical application – Hoia Forest (I).	Explanation, demonstration, discovery learning, and practical application. Teamwork.	Practical field trip
Spatial Model of Population Distribution in Plants and Animals: Methods and techniques for field identification. Evaluating tree species' density using the distance method Practical application – Hoia Forest (II).	Explanation, demonstration, discovery learning, and practical application. Teamwork.	Practical field trip
Type of Spatial Distribution and Density of Oak and Hornbeam Populations in Hoia Forest: Processing, analysing, and interpreting data obtained in the field.	Explanation, demonstration, exercise, discovery learning.	
Animal Species Abundance: Population size and density. Estimating the size of an animal population using the capture-mark-recapture method (laboratory simulation - groups). Lincoln-Petersen, Schnabel: calculating and interpreting indices based on data obtained by the CMR method (individual).	Explanation, demonstration, exercise, discovery learning, problem-solving, teamwork.	
Litter - Community of Organisms: Soil sample processing using the Berlese-Tullgren funnel, separating the biotic component, identifying the main invertebrate groups, applying ecological indices to characterize the quality and quantity of the biocenosis. Identifying the ecological/trophic niche.	Explanation, demonstration, exercise, experiment, problem-solving.	
Interspecific Relationships: Competition and predation. Prey-predator relationship. Population curve effects. Consequences of predator elimination from an ecosystem.	Explanation, heuristic conversation, case study, demonstration, exercise, problem-solving.	
Interspecific Relationships: Parasitism, amensalism, commensalism, mutualism. Effects of parasitism on the ecosystem.	Explanation, heuristic conversation, case study, demonstration, exercise, problem-solving.	
Evaluating the Conservation Status of Species and Habitats: Applying the evaluation matrix to datasets (groups). Management measures to maintain or return populations to a favourable conservation status. Practical application: developing measures for previously evaluated populations (groups).	Explanation, heuristic conversation, case study, demonstration, exercise, problem-solving.	
Estimating the Consequences of Species Introduction into Natural Ecosystems: Management measures. Ecosystem stability. Changes in composition and structure. Climate influence on species.	Explanation, heuristic conversation, case study, demonstration, exercise, problem-solving.	Practical field trip. Faget forest
Infrastructure and Ecosystem Interactions: The relationship between infrastructure (such as roads, buildings, and industrial developments) and ecosystems	The lecture, explanation, heuristic conversation, demonstration, exercise.	

Bibliography:

Battes, K.P., 2012, Ecologie generală, ghid de lucrări practice, Presa Universitară Clujeană, Cluj-Napoca
Jarvis Ph., Fowler J., Cohen L., 1998. Practical Statistics for Field Biology. John Wiley & Sons, USA

Jorgensen, S., Fath, B. 2007. A new ecology. System perspective. Elsevier.
McCleery, R., Monadjem, A., Conner, M., Austin, J., Taylor, P. 2021 Methods for ecological research on terrestrial small mammals. John Hopkins University Press
Murray, D. & Sandercock, B. 2020. Population ecology in practice. Wiley Blackwell
Sevianu, E. în Petrovici, M., Boboescu, I. (coord.) 2010. Lucrări practice de ecologie. Ed. Univ. Oradea
Sîrbu, I., Benedek A.M. 2004. Ecologie practică. Sibiu.
Weather, P., Bell, J., Cook, P. 2011. Practical Field Ecology: A Project Guide. Wiley-Blackwell, UK
Murray, D, Sandercock, B. 2020. Population Ecology in practice. Wiley-Blackwell

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 of the course and practical activities focus on practical, field-based knowledge and was developed based on the expertise in the fields of ecology and ecological management, environmental protection, evaluation of anthropogenic impact on the environment, and possibilities for rehabilitating degraded biotic environments. The knowledge and skills acquired will be used to understand how the living world functions in relation to the abiotic environment. The professional and transversal competencies specific to this discipline are essential for professionals in the field of environmental science and engineering, as they provide a foundation for understanding the relationships between living organisms and their environment and preparing for effective environmental management and rehabilitation strategies.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	The level of understanding of ecological phenomena and processes, knowledge of specific terminology. The quantity and quality of accumulated knowledge	final written exam	50%
10.5 Seminar/lab activities	The degree of mastery of the practical aspects	written test	50%

10.6 Minimum performance standards

- Mastering the basic theoretical knowledge in the field of ecology
- Developing skills for field and laboratory work
- Using specific devices and equipment
- Developing basic interpersonal skills
- Participating in at least 10 practical works
- Passing the exam is conditional on obtaining a passing grade in both tests (laboratory examination and course examination). If the student obtains a passing grade in only one of the tests, they can choose to repeat only the test they did not pass during the retake session. For any subsequent exams, the student must take both tests.

Date 5.12.2024 Signature of course coordinator Signature of seminar coordinator

Date of approval Signature of the head of department