SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeş Bolyai University**
1.2 Faculty	**Faculty of Biology and Geology**
1.3 Department	**Department of Molecular Biology and Biotechnology**
1.4 Field of study	**Biology**
1.5 Study cycle	**Master**
1.6 Study programme / Qualification	**Bioinformatics applied in life sciences**

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			**Remote sensing data in ecology** **Gestionarea și analiza datelor satelitare în ecologie**				
2.2 Course coordinator			**CS II dr. Turtureanu Pavel Dan**				
2.3 Seminar coordinator			**CS II dr. Turtureanu Pavel Dan**				
2.4. Year of study	**2**	2.5 Semester	**3**	2.6. Type of evaluation	**C**	2.7 Type of discipline	**Elective**
2.8 Code of the discipline		**BME1131**					

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					24
Additional documentation (in libraries, on electronic platforms, field documentation)					18
Preparation for seminars/labs, homework, papers, portfolios and essays					16
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	• Database, statistics
4.2. competencies	• Advanced programming skills

5. Conditions (if necessary)

5.1. for the course	• Videoprojector
5.2. for the seminar /lab activities	• Computers, specific development environment

6. Specific competencies acquired

Professional competencies	**C5.3** The ability to understand and handle data/satellite products **C5.4** Assessing parameters derived from satellite products **C5.5** Statistical analysis of satellite products
Transversal competencies	**CT1.** Application of efficient work rules and responsible attitudes towards the scientific domain, for the creative exploitation of one's own potential according to the principles and rules of professional ethics **CT2.** Efficient conduct of activities organized in an interdisciplinary group and development of empathic capacity of interpersonal communication, networking and collaboration with diverse groups **CT3.** Use of efficient methods and techniques for learning, information, research and development of abilities for knowledge exploitation, for adapting to the needs of a dynamic society and for communication in a widely used foreign language.

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

7.1 General objective of the discipline	• To learn concepts and specific techniques to manage and analyse datellite data
7.2 Specific objective of the discipline	• Students will learn concepts and gather various skills of integrating, structuring, storing/managing satellite products and derived parameters. The work will focus specifically on R functions and packages

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction	• Interactive exposure • Presentation • Explanation • Practical examples • Case-study discussions	
2. Techniques used in acquiring ecological information by satellites		
3. Sources of satellite imagery		
3. Processing satellite imagery		
4-5. Manipulating and exploring satellite images		
6. Specific indices		
7. Land cover classification using satellite images		
8. Temporal data and ecosystem monitoring		
9. Greening trends in relation to climate change		
10. Satellite imagery applied to species distribution modelling		
11. Remote sensing of the terrestrial carbon cycle		
12. Satellite imagery applied in assessing anthropogenic pressures		
13-14. Students' presentations		
Bibliography		

1. Pettorelli, N. 2019. Satellite remote sensing and the management of natural resources. Oxford University Press, UK.
2. Wegmann, M., Leutner, B., Dech, S. 2016. Remote Sensing and GIS for Ecologists. Pelagic Publishing, UK.
3. Pettorelli, N. 2013. The Normalized Difference Vegetation Index. Oxford University Press, UK.
4. Kamusoko, C. 2019. Remote Sensing Image Classification in R. Springer Geography, Singapore.
5. Carlson, B. Z., Corona, M. C., Dentant, C., Bonet, R., Thuiller, W., & Choler, P. (2017). Observed long-term greening of alpine vegetation—a case study in the French Alps. Environmental Research Letters, 12(11), 114006.
6. Choler, P. (2015). Growth response of temperate mountain grasslands to inter-annual variations in snow cover duration. Biogeosciences, 12(12), 3885-3897.
7. Xiao, J., Chevallier, F., Gomez, C., Guanter, L., Hicke, J. A., Huete, A. R., ... & Zhang, X. (2019). Remote sensing of the terrestrial carbon cycle: A review of advances over 50 years. Remote Sensing of Environment, 233, 111383.
8. He, K. S., Bradley, B. A., Cord, A. F., Rocchini, D., Tuanmu, M. N., Schmidtlein, S., ... & Pettorelli, N. (2015). Will remote sensing shape the next generation of species distribution models?. Remote Sensing in Ecology and Conservation, 1(1), 4-18.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Sources of satellite imagery	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
2. Manipulating and pre-processing satellite imagery		
3. Deriving information and computing indices		
4. Satellite image classification		
7. Students' project presentations		

Bibliography

1. Pettorelli, N. 2019. Satellite remote sensing and the management of natural resources. Oxford University Press, UK.
2. Wegmann, M., Leutner, B., Dech, S. 2016. Remote Sensing and GIS for Ecologists. Pelagic Publishing, UK.
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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 course is already included in the curriculum of many universities in the world.
- The content of this course is considered important by all research entities, as well as those focused on nature conservation and the management of natural resources

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Know concepts and methods from the domain of data mining and knowledge discovery	Research report and presentation	50%
10.5 Seminar/lab activities	Apply data mining techniques in real problems	Project implementation and presentation	50%
10.6Minimum performance standards			
Each student should obtain minimum 5 for the research report and for the final grade. In order to obtain the minimum grade 5, the student must demonstrate knowledge of concepts and working with biodiversity and climate data.			

Date	Signature of course coordinator	Signature of seminar coordinator
16.01.2023	**CS II dr. Pavel Dan Turtureanu**	**CS II dr. Pavel Dan Turtureanu**

Date of approval	Signature of the head of department
20.01.2023	**Assoc. Prof. Beatrice Kelemen**