SYLLABUS

Remote sensing data in ecology

University year 2025-2026

1. Information regarding the programme

1.1. Higher education institution	**Babeș 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**
1.7. Form of education	**Full-time**

2. Information regarding the discipline

2.1. Name of the discipline	**Remote sensing data in ecology**				Discipline code	**BME1131**	
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	**E**	2.7 Type of discipline	**Elective**

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 for individual study (ID) and self-study activities (SA)	**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

6.1. Specific competencies acquired [1]

[1] One can choose either competences or learning outcomes, or both. If only one option is chosen, the row related to the other option will be deleted, and the kept one will be numbered 6.

Professional/essential 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.

6.2. Learning outcomes

Knowledge	
Skills	
Responsibility and autonomy:	

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 for obtaining ecological information through satellites		
3. Satellite image sources		
4. Satellite image processing		
5. Manipulation and exploration of satellite data		
6. Specific indices		
7. Land cover classifications based on satellite images		
8. Temporal data and monitoring ecosystem changes		
9. The greening phenomenon in relation to climate change		
10. Use of satellite images in ecosystem distribution modeling		
11. Remote sensing of carbon in terrestrial ecosystems		
12. Use of satellite images in assessing anthropogenic pressures		
13-14. Students' presentations		

Bibliography

- Pettorelli, N. 2019. Satellite remote sensing and the management of natural resources. Oxford University Press, UK.
- Wegmann, M., Leutner, B., Dech, S. 2016. Remote Sensing and GIS for Ecologists. Pelagic Publishing, UK.
- Pettorelli, N. 2013. The Normalized Difference Vegetation Index. Oxford University Press, UK.
- Kamusoko, C. 2019. Remote Sensing Image Classification in R. Springer Geography, Singapore.
- 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.
- Choler, P. (2015). Growth response of temperate mountain grasslands to inter-annual variations in snow cover duration. Biogeosciences, 12(12), 3885-3897.
- 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.
- 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

- Pettorelli, N. 2019. Satellite remote sensing and the management of natural resources. Oxford University Press, UK.
- 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

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	Know concepts and methods from the domain of remote sensing and knowledge discovery	Test of theoretical knowledge	50%
10.5 Seminar/laboratory	Apply remote sensing techniques in real problems	Project implementation and presentation	50%
10.6 Minimum standard of performance			

- 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 remote sensing data.

11. Labels ODD (Sustainable Development Goals)[2]

	General label for Sustainable Development							
								
								

Date:
17.01.2025

Signature of course coordinator

CS II dr. Pavel Dan Turtureanu

Signature of seminar coordinator

CS II dr. Pavel Dan Turtureanu

Date of approval:
20.01.2025

Signature of the head of department

Conf. dr. Beatrice Kelemen

[2] Keep only the labels that, according to the *Procedure for applying ODD labels in the academic process*, suit the discipline and delete the others, including the general one for *Sustainable Development* – if not applicable. If no label describes the discipline, delete them all and write „*Not applicable*.".