

SYLLABUS

SPATIAL DATA ANALYSIS IN R

University year 2025-2026

1. Information regarding the programme

1.1. Higher education institution	Babeş-Bolyai University
1.2. Faculty	Faculty of Biology and Geology
1.3. Department	Integrative Biology
1.4. Field of study	BIOLOGY
1.5. Study cycle	Doctorate
1.6. Study programme/Qualification	Doctoral training / PhD in Biology
1.7. Form of education	Full-time

2. Information regarding the discipline

2.1. Name of the discipline	Spatial data analysis in R			Discipline code	BDR1111		
2.2. Course coordinator	Turtureanu Pavel-Dan, Laszlo Zoltan						
2.3. Seminar coordinator	Turtureanu Pavel-Dan, Laszlo Zoltan						
2.4. Year of study	1	2.5. Semester	1	2.6. Type of evaluation	C	2.7. Discipline regime	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	48	of which: 3.5 course	24	3.6 seminar/laborator	24
Time allotment for individual study (ID) and self-study activities (SA)					hours
3.5.1. Learning using manual, course support, bibliography, course notes (SA)					54
3.5.2. Additional documentation (in libraries, on electronic platforms, field documentation)					54
3.5.3. Preparation for seminars/labs, homework, papers, portfolios and essays					35
3.5.4. Tutorship					28
3.5.5. Evaluations					4
3.5.6. Other activities					-
3.7. Total individual study hours	204				
3.8. Total hours per semester	252				
3.9. Number of ECTS credits	7				

4. Prerequisites (if necessary)

4.1. curriculum	Not applicable
4.2. competencies	Basic knowledge of geography and ecology User-level computing skills Speaking and writing skills in English

5. Conditions (if necessary)

5.1. for the course	Audio-video logistics, whiteboard, access to WiFi internet
5.2. for the seminar /lab activities	Audio-video logistics, whiteboard, access to WiFi internet

6.1. Specific competencies acquired

Professional/ essential competencies	<ul style="list-style-type: none"> Integrating georeferenced ecological information into accessible, digital systems. Manipulating georeferenced ecological information. Mapping and performing of exploratory/statistical analyses on information derived from georeferenced data.
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Transversal competencies	<ul style="list-style-type: none"> Competences in the analysis of spatial data, a requisite of scientific research in any field of biogeography and ecology, which involves a quantitative approach.
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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 create, manipulate, map and perform analyses on spatial data.
7.2 Specific objective of the discipline	To learn various techniques to integrate, structure, store and analyse spatial data for further analyses, as implemented in the R statistical environment.

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction to R	Presentation, discussion, case studies	2 hours
2. Types of spatial objects		2 hours
3. Loading and interrogating spatial data		2 hours
4. Visualize spatial data		2 hours
5. Multiple spatial data manipulation		2 hours
6. Spatial data analysis I: patterns		2 hours
7. Spatial data analysis II: statistics		2 hours
8. Introduction to remote sensing		2 hours
9. Remote sensing data processing		2 hours
10. Remote sensing image classification		2 hours
11. The Normalized Difference Vegetation Index		2 hours
12. Greening trends		2 hours

Bibliography Bivand, R., Pebesma, E., Gómez-Rubio, V. (2013) Applied Spatial Data Analysis with R. Springer New York, NY. Pettorelli, N. (2019) Satellite remote sensing and the management of natural resources. Oxford University Press, UK. Spector, P. (2008) Data manipulation with R. Springer, Printforce, Netherlands. Wegmann, M., Schwalb-Willmann, J., & Dech, S. (2020) An Introduction to Spatial Data Analysis: Remote Sensing and GIS with Open Source Software. Pelagic Publishing Ltd.		
8.2 Seminar / laboratory	Teaching methods	Remarks
1. First steps in R	Practical work. Problem-solving and discussion.	2 hour
2. Manipulating spatial objects		2 hour
3. Interrogating spatial objects		2 hour
4. Visualizing spatial data:		2 hour
5. Multiple spatial data manipulation:		2 hour
6. Spatial data analysis I: patterns		2 hour
7. Spatial data analysis II: statistics		2 hour
8. Introducing remote sensing products		2 hour
9. Remote sensing data processing		2 hour
10. Remote sensing image classification		2 hour
11. Using the Normalized Difference Vegetation Index		2 hour
12. Assessing greening trends		2 hour
Bibliography <ul style="list-style-type: none"> • Crawley, M.J. (2013) The R Book, 2nd edition. John Wiley, UK. • Chang, W. (2013) R Graphics Cookbook. O'Reilly Media, CA. • Kamusoko, C. (2019) Remote Sensing Image Classification in R. Springer Geography, Singapore. • Spector, P. (2008) Data manipulation with R. Springer, Printforce, Netherlands. 		

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

<ul style="list-style-type: none"> • The course has a similar content to courses from other European universities, and considers the level of training and abilities of doctoral students. • The content of the course is regularly updated and incorporates the most novel approaches from the field of ecology, nature conservation, biogeography. • The course is fundamental for doctoral students in the field of ecology, as quantitative skills are essential for scientific research activities.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Courses, seminars/laboratory classes	Knowledge of informational content, skills in analysis and synthesis of information	Colloquium (written project)	100%
10.6 Minimum standard of performance <ul style="list-style-type: none"> • Knowledge of the information contained in the course and laboratory 			

11. Labels ODD (Sustainable Development Goals)

	General label for Sustainable Development						
							

Date:
07.04.2025

Signature of course coordinator

C.S. II Dr. Turtureanu Pavel Dan/
Conf. Dr. László Zoltán

Signature of seminar coordinator

C.S. II Dr. Turtureanu Pavel Dan/
Conf. Dr. László Zoltán

Date of approval:

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Signature of the doctoral school director

Prof. Pap Péter László