SYLLABUS

Remote Sensing in Geosciences

University year 2025 - 2026

1. Information regarding the programme

1.1. Higher education institution	Universitatea Babeș-Bolyai din Cluj Napoca
1.2. Faculty	Of Geography
1.3. Department	Doctoral School of Geography
1.4. Field of study	Geography
1.5. Study cycle	Doctoral Studies
1.6. Study programme/Qualification	Doctoral School of Geography
1.7. Form of education	Full-time

2. Information regarding the discipline

2.1. Name of the discipline	**Remote Sensing in Geosciences**					Discipline code	**DG1106**
2.2. Course coordinator				Iulian-Horia Holobaca			
2.3. Seminar coordinator				Iulian-Horia Holobaca			
2.4. Year of study	I	2.5. Semester	I	2.6. Type of evaluation	E	2.7. Discipline regime	optionaly

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	**1**
3.4. Total hours in the curriculum	36	of which: 3.5 course	24	3.6 seminar/laborator	**12**
Time allotment for individual study (ID) and self-study activities (SA)					**hours**
3.5.1. Learning using manual, course support, bibliography, course notes (SA)					30
3.5.2. Additional documentation (in libraries, on electronic platforms, field documentation)					30
3.5.3. Preparation for seminars/labs, homework, papers, portfolios and essays					30
3.5.4. Tutorship					30
3.5.5. Evaluations					1
3.5.6. Other activities:					18
3.7. Total individual study hours	**139**				
3.8. Total hours per semester	**175**				
3.9. Number of ECTS credits	**7**				

4. Prerequisites (if necessary)

4.1. curriculum	-
4.2. competencies	-

5. Conditions (if necessary)

5.1. for the course	Minimum 3 attendances
5.2. for the seminar /lab activities	Minimum 6 attendances

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	• Advanced analysis and interpretation of multispectral and radar remote sensing data in geoscientific research. • Design and application of preprocessing, classification, and change detection methodologies in complex spatio-temporal contexts. • Critical integration of satellite imagery into geospatial systems (GIS) and environmental analysis models.
Transversal competencies	• Autonomous management of a research project based on satellite data. •Rigorous scientific argumentation and communication of results to academic and professional audiences. • Responsible methodological decision-making, including evaluation of scientific and applied impact.

6.2. Learning outcomes

Knowledge	The student knows: • the physical and methodological principles of active and passive remote sensing; • the technical characteristics of satellite imagery and the stages of image processing; • the major fields of application of remote sensing in environmental monitoring and change detection.
Skills	The student is able to: • process and interpret satellite imagery using methods appropriate to research objectives; • integrate remote sensing data into complex geospatial analyses; • critically evaluate the accuracy and relevance of the obtained results.
Responsibility and autonomy:	The student has the ability to work independently to obtain: • design and implement a research study based on remote sensing data; • select and justify the applied methods; • assume responsibility for the scientific validity and impact of the results.

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

7.1 General objective of the discipline	• To explain how remote sensing provides a spatial perspective on the geographical environment.
7.2 Specific objective of the discipline	• To inventory methods for observing environmental components according to their applicability. • To highlight the integration of satellite scenes into complex geospatial systems. • To present major applications of satellite imagery.

8. Content

8.1 Course	Teaching methods	Remarks
1. Stages of remote sensing	Lecture, interactive debate, problem-based learning	
2. Active and passive remote sensing	Lecture, interactive debate, problem-based learning	
3. Characteristics of remote sensing imagery	Lecture, interactive debate, problem-based learning	
4. Image preprocessing	Lecture, interactive debate, problem-based learning	
5. Information extraction and spatial integration	Lecture, interactive debate, problem-based learning	
6. Applications in hydrosphere monitoring	Lecture, interactive debate, problem-based learning	
7. Applications in vegetation monitoring	Lecture, interactive debate, problem-based learning	
8. Applications in cryosphere monitoring	Lecture, interactive debate, problem-based learning	
9. Applications in change detection	Lecture, interactive debate, problem-based learning	
10. Applications in disaster management	Lecture, interactive debate, problem-based learning	
11. Applications in human geography	Lecture, interactive debate, problem-based learning	
12. Evaluation	Frontal evaluation	

Bibliography

1. Gupta Ravi P., Remote sensing geology. Berlin: Springer-Verlag, 1991.
2. Loghin, Vasile, Teledetectia spatiala a Terrei. Târgoviște : Domino, 1998.
3. Popescu Cosmin-Alin, Teledetecţie şi sisteme informatice geografice în agricultură. Timișoara : Eurobit, 2007.
4. Regrain Raymond, Géographie physique et télédétection des marais charentais. Amiens : [Université de Picardie], 1980.
5. Smith William L., Remote-sensing applications for mineral exploration. Stroudsburg, Pa : Dowden, Hutchinson & Ross, 1977.

*** Le sous-sol exploré depuis l'espace. Brussels : Credit Communal de Belgique, 1990

8.2 Seminar / laboratory	Teaching methods	Remarks
I. Monitoring changes in the Elbrus glacier system (1985–2007)	Lecture, interactive debate, problem-based learning	
II. Flooded area detection using SAR imagery	Lecture, interactive debate, problem-based learning	
III. Deforestation detection using SAR imagery	Lecture, interactive debate, problem-based learning	
IV. Detection of volcanic eruptions through interferometry	Lecture, interactive debate, problem-based learning	
V Final project preparation	Lecture, interactive debate, problem-based learning	
Evaluation	Project presentations	

Bibliography

Regrain Raymond, Géographie physique et télédétection des marais charentais. Amiens : [Université de Picardie], 1980.

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 syllabus was developed based on internationally recognized academic textbooks and consultation with representatives of the National Meteorological Administration (Cluj-Napoca Regional Meteorological Center).

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	Frontal examination	Multiple-choice written exam	75 %
10.5 Seminar/laboratory	Project presentation	Project presentation	25
10.6 Minimum standard of performance			
• Minimum grade 5 in the theoretical exam • Completion of the individual project			

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

	General label for Sustainable Development							
								

Date: Signature of course coordinator Signature of seminar coordinator

Date of approval: Signature of the head of department

[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.*”.