COURSE DESCRIPTION

Statistical and quantitative methods in geology and paleontology

Academic Year 2026-2027

1. Programme-related data

1.1. Higher education institution	Babeş-Bolyai University
1.2. Faculty	Faculty of Biology and Geology
1.3. Department	Department of Geology
1.4. Field of study	Geology
1.5. Study cycle	Master
1.6. Study programme/Qualification	Geology of Energy Resources
1.7. Form of education	With frequency

2. . Course-related data

2.1. Course Title	**Statistical and quantitative methods in geology and paleontology**			Course code	**BME1121**
2.2. Course coordinators	Conf. Dr. Lóránd Silye, Şef. Lucr. dr. Raluca Haitonic				
2.3. Seminar coordinators	Conf. Dr. Lóránd Silye, Şef. Lucr. dr. Raluca Haitonic				
2.4. Year of study	1	2.5. Semester	2	2.6. Type of evaluation	Examen
2.7. Course Status	Opţional		2.8. Course Type		Disciplină de specializare (DS)

3. Total estimated time (hours per semester of teaching 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/laborator	28

Time allotment for individual study (ID) and self-study activities (SA)	**hours**
Learning from textbooks, course materials, bibliography, and notes (IS)	30
additional research in the library, on subject-specific electronic platforms, and on-site	20
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays	28
Tutoring (professional guidance)	10
Examinations	4
Other activities:	2
Total hours of individual study (IS) and self-taught activities (ST)	**94**
3.8. Total hours per semester	**150**
3.9. Number of ECTS credits	**6**

4. Prerequisites (if necessary)

4.1. curriculum	Prior acquisition of basic knowledge in the field of sedimentary geology
4.2. competencies	Use of microscope and computer

5. Specific Conditions (if necessary)

5.1. for the course	Video logistical support; active-participatory methods; examples.
5.2. for the seminar /lab activities	Participation in at least 70% of the practical work is a requirement for taking the exam.

6.1. Competencies resulting from the completion of the degree programme (as referred to in the curriculum)

Professional Competencies	
Competency Code	**Competency**
CP1	Applies geological, geochemical and geophysical knwoledge in order to characterise and evaluate the energetical resources.
CP2	Uses information tools and other digital instruments for hydrocarbon and mineral resource exploration
CP3	Performs laboratory analyses and interprets results in order to evaluate the energetic resources
CP4	Analyses complex problems in the field of energetic resource exploration
CP5	Analyses complex problems in the field of energetic resource exploration
Transversal Competencies	
Competency Code	**Competency**
CT1	Communicates efficiently technical and scientific information
CT2	Works efficiently in multidisciplinary teams in order to achieve the common objectives
CT3	Continuously improves and constantly acquires new working methods in the field of energy resources

6.2. . Learning outcomes relevant to the degree programme (as referred to in the curriculum)

Learning outcomes targeted by the subject		
Competency Code	**Knowledge and understanding**	**Specific academic skills**
CP1	Understands concepts required to analyze complex problems	Identifies, and analyzes complex problems in energetic resource exploration using scientific and digital methods.
CP2	Knows the structure, rules, and standards for writing technical reports and scientific papers, as well as principles of interdisciplinary collaboration.	Writes technical reports and scientific papers within multidisciplinary teams, integrating contributions from different fields.
CP3	Knows the principles of teamwork, professional roles, and collaboration dynamics in multidisciplinary teams.	Works effectively in multidisciplinary teams, communicating clearly and actively contributing to the achievement of common goals.

7. Subject-specific learning outcomes

Knowledge and understanding
Understand the fundamental principles of statistical analysis applied to paleontological data, including univariate and multivariate analysis.
Know the methods of acquisition, structuring, and processing of micropaleontological data, as well as the associated limitations and potential errors.
Understand taphonomic processes and their impact on fossil assemblages, as well as how they influence statistical interpretation.

Know diversity indices and their applicability in paleoecology, as well as how they can be used in interpreting fossil communities.
Understand the principles of integrating statistical results and the limits of quantitative interpretation in paleontology.
Know methods for the graphical presentation of data in vector or raster formats.
Specific academic skills
The ability to acquire, organize, and analyze micropaleontological datasets using appropriate statistical methods.
The ability to apply univariate and multivariate analyses to interpret distributions, relationships, and variation within fossil assemblages.
The competence to calculate and interpret diversity indices, using them in paleoecological reconstructions.
The use of digital tools and specialized software for statistical analysis and graphical representation of paleontological data.
The preparation of scientific presentations and reports based on quantitative analyses, in individual or team settings.

8. Contents

8.1 Course	Teaching and learning methods	Remarks
1. Ecological information and taphonomic processes reflected by fossil assemblages: their impact on micropaleontological data	Lecture, case studies, discussions.	
2. Introduction to methods for analyzing micropaleontological data		
3-4. Principles and methods for the acquisition and analysis of micropaleontological data		
5. Univariate data analysis		
6-7. Multivariate data analysis		
8. Diversity indices and their use in paleoecology		
9. Morphometrics		
10. Time series analysis		
11. Quantitative methods used in the reconstruction of paleoproductivity		
12. Plotting and presentation in vector or raster formats		
13-14. Integration of results: the usefulness and risks of quantitative methods in the interpretation of paleontological data		
8.2 Seminary / laboratory	Teaching and learning methods	Remarks
Case studies prepared for students (acquisition and analysis of specific datasets)	Lecture, case studies, discussions, practical exercises	
Tests and practical exercises		

Bibliography

- Everitt, B.S., Landau, S., Leese, M., Stahl, D., 2011. Cluster Analysis, 5th Edition, Wiley, 352 pp.
- Sen Gupta, B.K., 2003. Modern Foraminifera, Springer, Dordrecht, 371 pp.
- Hammer, Ø., Harper, D.A.T., 2006. Paleontological Data Analysis. Blackwell, Oxford, 351 pp.
- Hammer, Ø., Harper, D.A.T., Ryan, P.D., 2001. Past: Paleontological Statistics Software Package for Education and Data Analysis. Palaeontologia Electronica, v. 4, 1, art 4, p. 1-9.
- Murray, J.W., 1991. Ecology and Palaeoecology of Benthic Foraminifera. Longman Scientific&Technical, Harlow, 397 pp.
- Murray, J.W., 2006. Ecology and Applications of Benthic Foraminifera. Cambridge University Press, Cambridge, 426 pp.

9. Evaluation

Activity type	9.1 Evaluation criteria	9.2 Evaluation methods	9.3 Percentage of final grade
9.4 Course	Knowledge of the informational content	Exam	30%
9.5 Seminary/laboratory	Activity during seminars	Discussions	10%
	Assessment of knowledge	Practical test	60%
9.6 Minimum standard of performance			
• 50 % of the theoretical concepts taught in the course; • 50% of the practical exercises			

10. SDG Labels (Sustainable Development Goals)

		Sustainable Development Generic Label

Date of entry: 09.04.2026

Signature of course coordinator .....

Signature of seminar coordinator .....

Date of approval in the department: 27.04.2026

Signature of the head of department .....