SYLLABUS

Biostratigraphy

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	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. Information regarding the discipline

2.1. Name of the discipline	**Biostratigraphy**				Discipline code	**BME1113**	
2.2. Course coordinators	Dr. Raluca Haitonic, Lecturer Dr. Lóránd Silye, Assoc. Prof. Dr. George Pleş, Lecturer Dr. Carmen Chira, Assoc. Prof. Dr. Szabolcs Kövecsi, Lecturer Dr. Ioan Tanţău, Prof. Dr. Ioan Bucur, Prof. Dr. Sorin Filipescu, Prof.						
2.3. Seminar coordinators							
2.4. Year of study	1	2.5. Semester	1	2.6. Type of evaluation	E	2.7. Discipline regime	Mandatory

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/laborator	28
Time allotment for individual study (ID) and self-study activities (SA)					**hours**
Learning using manual, course support, bibliography, course notes (SA)					30
Additional documentation (in libraries, on electronic platforms, field documentation)					30
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					10
Evaluations					4
Other activities:					
3.7. Total individual study hours	**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. 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. Specific competencies acquired [1]

Professional/essential competencies	• The ability to identify significant microfossils and dating various sedimentary deposits; • Ability to interpret the indirect information used in biostratigraphy, provided by paleoecology, paleobiogeography, and paleoclimatology; • The possibility to evaluate determined associations in a paleoecological context; • The possibility to use the data in practical studies on deposits with significance for hydrocarbon exploration; • Ability to write reports and scientific papers.
Transversal competencies	• Integration of knowledge within the framework of that acquired through other disciplines in the master's program; • Acquiring some basic knowledge than can be used in the interpretation of the basin evolution and petroleum systems; • Skills for studying within complex research-exploration teams focused on hydrocarbon deposits; • Teamwork abilities.

6.2. Learning outcomes

Knowledge	The student knows: - various types of biostratigraphically important microfossils; - the general aspects of the paleoenvironments of microorganisms from the Mesozoic and Cenozoic eras; - the general systematics of certain groups of microorganisms (chiefly foraminifera, calcareous algae, nannoplankton, calpionellids, and palynomorphs).
Skills	The student is able to: - recognize genera and species of microfossils important for dating sedimentary sequences; - collect and prepare micropaleontological material from diferent rocks (shales, carbonates, peat-bogs, etc.) for microscope analysis.
Responsibility and autonomy:	The student has the ability to work independently to analyze micropaleontological material using fast analytical methods (e.g., optical microscopy). Thus, the student will be able to identify the main diagnostic features characteristic of different genera/species of biostratigraphically important microfossils.

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

7.1 General objective of the discipline	• The in-depth study by master's students of several important groups of benthic and planktonic microfossils (including foraminifera, calcareous algae, nannoplankton, calpionellids, and palynomorphs) that are essential for age-dating sedimentary deposits from the Mesozoic and Cenozoic eras.
7.2 Specific objective of the discipline	• Learning the principles of Biostratigraphy through case studies for various ages and foraminifera groups (planktonics, small benthics, large benthics, agglutinated in siliciclastic and carbonate settings); • Applications of paleoecology, paleobiogeography, and paleoclimatology to biostratigraphy; • The use of biostratigraphic data to basin reconstructions.

8. Content

[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.

8.1 Course	Teaching methods	Remarks
Course 1. Foraminifera and ostracoda. General characteristics.	Presentation, discussions, case studies	
Course 2. Agglutinated foraminifera.	Presentation, discussions, case studies	
Course 3. Small calcareous benthic foraminifera.	Presentation, discussions, case studies	
Course 4. Large benthic foraminifera.	Presentation, discussions, case studies	
Course 5. Planktonic foraminifera.	Presentation, discussions, case studies	
Course 6. Ostracoda.	Presentation, discussions, case studies	
Course 7. Calcareous nannoplankton. General characteristics.	Presentation, discussions, case studies	
Course 8. Calcareous nannofossils biostratigraphy throughout Cretaceous and Cenozic.	Presentation, discussions, case studies	
Course 9. Microbialites and calcareous green algae. General characteristics.	Presentation, discussions, case studies	
Course 10. Red algae. General characteristics.	Presentation, discussions, case studies	
Course 11. Calpionellids. General characteristics.	Presentation, discussions, case studies	
Course 12. Calpionellid biozones.	Presentation, discussions, case studies	
Course 13. Palynology: introduction, groups of palynomorphs, Dinoflagellates and Chitinozoa.	Presentation, discussions, case studies	
Course 14. Palynology: pollen and spores.	Presentation, discussions, case studies	

Bibliography

1. Foraminifera and ostracoda:

- Armstrong, H.A., Brasier, M.D., 2005. **Microfossils**. 296 p. Blackwell Publishing.
- Cicha, I., Rögl, F., Rupp, Ch., Ctyroka, J., 1998. **Oligocene–Miocene Foraminifera of the Central Paratethys**. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, 549 pp.
- Gross, M., 2006. **Middle Miocene Ostracods from the Vienna Basin (Badenian/Sarmatian, Austria)**. Österreichische Akademie der Wissenschaften, Schriftenreihe der Erdwissenschaftlichen Kommissionen, v. Sonderband 1. Verlag Österreichische Akademie der Wissenschaften, Wien, 224 pp., (in German).
- Hottinger, L., 1974. **Alveolinids, Cretaceous-Tertiery larger Foraminifera**. Esso Production Research-European Laboratories.
- Kaminski, M.A., Gradstein, F.M. and collaborators, 2005. **Atlas of Paleogene Deep Water Agglutinated Foraminifera**. 547 p.
- Kennett, J.P., Srinivasan, M.S., 1983. **Neogene Planktonic Foraminifera**. A Phylogenetic Atlas. 265 p. Hutchinson Ross Publ. Co. Stroudsburg.
- Less, G., 1987. **Paleontology and stratigraphy of the European Orthophragminae**. Geol Hung Palaeontol, 51:1-373.
- Loeblich, A., Tappan, H., 1964. **Protista**. In Moore, R.C.: Treatise on Invertebrate Paleontology, Part C 2/1-2, 900 p. Kansas Univ. Press.
- Loeblich, A., Tappan, H., 1988. **Foraminiferal genera and their classification**. 2 vol. Van Nostrand Reinhold Co. New York.
- Popescu, G., 1975. **Études des foraminiféres du Miocène inférieur et moyen du nordouest de la Transylvanie**. Mémoires, Institut de Géologieet de Géophysique, 23, 121 pp.
- Schaub, H., 1981. **Nummulites et Assilines de la Téthys Paléogène**. 238 p. Mémoires suisses de Paléontologie.

2. Calcareous nannofossils:

- Chira, C., 2000. **Nannoplancton calcaros şi moluşte miocene din Transilvania**, România. Ed. Carpatica, 183 p., 21 fig., 8 tab., 20 pl., Cluj-Napoca.
- Martini, E., 1971. **Standard Tertiary and Quaternary Calcareous Nannoplancton Zonation**. Proceed. of the II Planktonik Conference, p. 739 - 785, Roma (1970).
- Mészáros, N., and collaborators, 1991. Curs de nannoplancton. Univ. Babeş-Bolyai, 138 p., Cluj-Napoca.
- Okada, H., Bukry, D., 1980. **Supplimentary modifications and introduction of code numbers to the latitude coccolith biostratigraphic zonation**. D.S.D.P., 20, p. 355 - 374.

3. Microbialites, green and red algae:

- Berger, S., Kaever, M.J., 1992. **Dasycladales. An illustrated monograph of a fascinating algal order**. 247 p., G. Thieme Verlag, Stuttgart.
- Dragastan, O., 1980. **Alge calcaroase din Mezozoicul şi Terţiarul României**. 167 pag., 115 figs., 20 pls., Ed. Acad. RSR, Bucureşti.
- Riding, R., 2000. **Microbial carbonates: the geological record of calcified bacterial-algal mats and biofilms**. Sediment 47, 179–214.
- Braga, J.C., Vescogni, A., Bosellini, F.R., Aguirre, J., 2009. **Coralline algae (Corallinales, Rhodophyta) in western and central Mediter-ranean Messinian reefs**. Palæogeography, Palæoclimatology, Palæoecology, vol. 275, no. 1-4, p. 113-128.

4. Calpionellids:

- Bucur, I.I., 1992. **Calpionellids and calcispheres from the Upper Jurassic-Lower Cretaceous deposits in the Resita-Moldova Noua zone, Southern Carpathians, Romania**. Creatceous Research 13: 565-576.
- Pop, G., 1974. **Les zones des calpionellides tithoniques-valanginiennes du sillon de Resita (Carpathes Meridionales)**. Revue Roumaine de Geologic 18: 109-125.
- Pop, G., 1986. **Calpionellids and correlation of Tithonian-Valanginian formations**. Acta Geologica Hungarica 29: 93-102.

6. Palynology:

- Traverse, A., 2007. **Paleopalynology**. Topics in Geobiology, second ed. Springer, Dordrecht, Netherlands.
- Tyson, R.V., 1995. **Sedimentary Organic Matter: Organic facies and palynofacies**. Chapman and Hall, London.
- Vandenbroucke, M., Largeau, C., 2007. **Kerogen origin, evolution and structure**. Organic Geochemistry, 38, 719–833.

* ***All of these references can be found at the Department of Geology Library (1 M. Kogălniceanu street)***

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Visit to the micropaleontological sample preparation laboratory (preparation techniques, selection, and analysis of microfossils)	Discussions, case studies, microscope investigatons	
2. Agglutinated foraminifera (general characteristics, biozonation), microscope analysis, case studies.	Discussions, case studies, microscope investigatons	
3. Small calcareous benthic foraminifera (general characteristics, biozonation), microscope analysis, case studies.	Discussions, case studies, microscope investigatons	
4. Large calcareous benthic foraminifera (general characteristics, biozonation), macroscopic and microscopic analysis, case studies.	Discussions, case studies, microscopy	
5. Planktonic foraminifera (general characteristics, biozonation), microscope analysis, case studies.	Discussions, case studies, microscopy	
6. Ostracoda (general characteristics, biozonation), microscopic analysis, case studies.	Discussions, case studies, microscopy	

7. Calcareous nannoplankton (key features, optical microscopy, biozones).	Discussions, case studies, microscopy	
8. Calcareous nannoplankton (case studies).	Discussions, case studies, microscopy	
9. Microbialites and green algae (microbial products, calcified cyanobacteria, Halimedaceae, Dasycladales).	Discussions, case studies, microscopy	
10. Red algae (Solenoporaceae, Peyssonneliaceae, Corallinaceae).	Discussions, case studies, microscopy	
11. Calpionellids (general characteristics, biozones, microscopic investigations).	Discussions, case studies, microscopy	
12. Calpionellids (case studies from the Romanian Carpathians).	Discussions, case studies, microscopy	
13. Palynology. Dinoflagellates and Chitinozoa (general characteristics, optical microscopy).	Discussions, case studies, microscopy	
14. Palynology. Pollen and spores (optical microscopy, case studies).	Discussions, case studies, microscopy	

Bibliography

The same as those for the course.

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 lectures and lab activities are designed and updated to give the students the necessary scientific knowledge and practical abilities required by the professional environment.

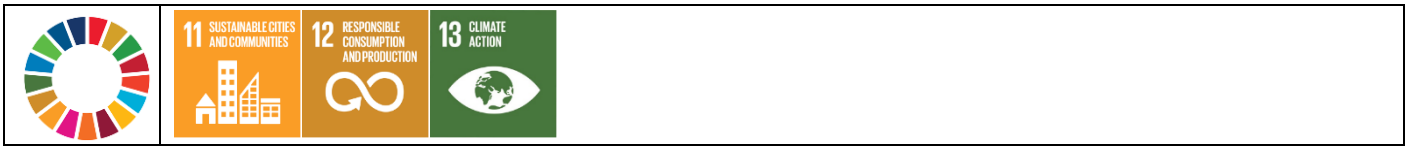
10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	Assessment of knowledge	Written exam	50%
10.5 Seminar/laboratory	Activity during lab sessions; assessment of knowledge	Practical test	50%
10.6 Minimum standard of performance			

- 50% of the subjects required by the written exam:
- 50% of the practical test

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

[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.*".



Date:	**Signature of course coordinator**	**Signature of seminar coordinator**
20.03.2025		
	Dr. George Pleș, Lecturer	Dr. George Pleș, Lecturer

Date of approval:	**Signature of the head of department**
28.03.2025	