SYLLABUS

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 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**

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			**Molecular Taxonomy** **Taxonomie moleculara**				
2.2 Course coordinator			**Prof. dr. Balint Márkó** **Assoc. Prof. dr. Beatrice Kelemen**				
2.3 Seminar coordinator			**Prof. dr. Balint Márkó** **Assoc. Prof. dr. Beatrice Kelemen**				
2.4. Year of study	**2**	2.5 Semeste	**3**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Elective**
2.8. Code of the discipline		**BMR1137**					

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:					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	• Genetics • Evolutionary Biology
4.2. competencies	• Average computer skills • Skills for working in molecular biology laboratory

5. Conditions (if necessary)

5.1. for the course	• Beamer • Online meeting platform
5.2. for the seminar /lab activities	• Attendance of a minimum of 90% of practical/ seminar classes, • Computers, specific development environment

6. Specific competencies acquired

Professional competencies	• Students will be able to: - define and explain the principles of taxonomy and molecular ecology; - choose and apply the appropriate molecular techniques in order to solve some taxonomic or ecological problems; - debate over and deepen the concepts of macroevolution and microevolution. • Students will develop the ability to discuss and present a scientific topic. They will acquire the ability to complete, both independently and as a team, the assigned work tasks.
Transversal competencies	• Acquiring the necessary / complementary information to conduct an individual project in molecular ecology and taxonomy • Use of concepts specific to macro- and micro-evolutionary theories

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

7.1 General objective of the discipline	• Integrarea cunoștiințelor de taxonomie, ecologie și genetică în vederea înțelegerii proceselor interconectate în teoriile macro- și microevolutive
7.2 Specific objective of the discipline	Since the last decades, both taxonomy and ecology have been revolutionized by the emergence of molecular techniques and the accessibility of new statistical methods that require the processing of complex databases. In this course, the students will have the opportunity to understand and become familiar with the object of study of this discipline. In parallel, in the laboratory works they will have the opportunity to apply practically the techniques presented from a theoretical point of view in the course. The most common molecular markers (proteins and DNA) used in taxonomy and ecology studies will be presented. Their resolution will be exemplified by case studies. In the second part of the course we will discuss the practical applications of molecular techniques in taxonomy and ecology. The following topics will be addressed: taxonomic clarifications, the concept of metapopulation, landscape genetics, conservation genetics and invasive species. The last part of the course will be devoted to a recapitulation and preparation of the topic for the final exam.

8. Content

8.1 Course	Teaching methods	Remarks
1. Taxonomy: principles and concepts	• Interactive explanation • Presentation	
2. Theory of 'species' – definitions, gaps, solutions		

3. Ecological bases of species delineation	• Explanation • Practical examples • Case-study discussions	
4. Ecological niche analyses		
5. Macroevolution and microevolution		
6. Integrative taxonomy: from traditional morphology to sequencing		
7. Molecular markers in systematics and ecology		
8. Genotype and phenotype: quantitative genetics		
9. Population evolution and structure: reproductive patterns, genetic drift and gene flow		
10. Natural selection and interactions among other evolutionary forces		
11 Molecular phylogeny		
12. Analytical methods		
13. Landscape genetics		
14. Rehearsal of course main concepts		

Bibliography
Avise JC, 2004. Molecular Markers, Natural History, and Evolution. Sinauer Associates Inc., 669p.
Bromham, L. (2016). An introduction to molecular evolution and phylogenetics. Oxford University Press.
Pontarotti, P. (Ed.). (2011). Evolutionary biology–concepts, biodiversity, macroevolution and genome evolution. Springer Science & Business Media.
Templeton, A. R. (2021). Population genetics and microevolutionary theory. John Wiley & Sons.
All references above are available in printed copies at the Librairies of the Faculty of Biology and Geology.

8.2 Seminar / laboratory	Teaching methods	Remarks
DNA extraction	• Interactive presentation and explanation • Conversation • Practical demonstration	
PCR amplification of some target fragments and their purification		
Sanger / NGS sequencing		
Multiple viewing, assembling, and alignment of DNA sequences Database queries, BLAST, phylogenetic trees.		
From hypothesis 0 to conclusion in taxonomy and molecular ecology.		
Problem solving in molecular taxonomy and ecology		
Final evaluation		

Bibliography
DeSalle, R., Giribet, G., & Wheeler, W. (Eds.). (2002). Techniques in molecular systematics and evolution. Springer Science & Business Media.

Baker A (ed.), 2000. Molecular Methods in Ecology. Blackwell Publishing, 352p.

Felsenstein J, 2004. Inferring Phylogenies. Sinauer Associates Inc., 580p.

All references above are available in printed copies at the Librairies of the Faculty of Biology and Geology.

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 applicable and allows the acquisition of practical skills needed to work in research and analysis laboratories and the interpretation of biological and theoretical data necessary for advanced bioinformatics analysis in research institutes or in R&D units at private companies.
- The course is listed in the curricula of similar specializations at Romanian and foreign Universities.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Knowledge of concepts and methods from the topics of the course	Written exam (combined test)	50%
10.5 Seminar/lab activities	Evaluation of a short individual project	Written colloquium (combined test)	50%
10.6Minimum performance standards			
Each student should obtain minimum 5 at the written exam and oral colloquium. In order to obtain the minimum grade 5, the student must demonstrate the mastery of the basic concepts described during the course and practicum classes.			

Date	Signature of course coordinator	Signature of seminar coordinator
16.01.2023	**Prof. Dr. Balint Marko**	**Prof. dr. Balint Marko**
	Assoc. Prof. dr. Beatrice Kelemen	**Assoc. Prof. dr. Beatrice Kelemen**

Date of approval	Signature of the head of department
20.01.2023	**Assoc. Prof. Beatrice Kelemen**