COURSE SYLLABUS

1. Data about the program

1.1 Higher education institution	Babeș-Bolyai University
1.2 Faculty	Faculty of Biology and Geology
1.3 Doctoral school	Integrative Biology
1.4 Field of study	BIOLOGY
1.5 Study cycle	Doctorate
1.6 Study program / Qualification	Doctoral training / PhD in Biology

2. Course data

2.1 Name of discipline	**Environmental molecular biology**						
2.2 Teacher responsible for lectures	Prof. Dr. Horia Banciu						
2.3 Teacher responsible for seminars	Prof. Dr. Horia Banciu						
2.4 Year of study	1	2.5 Semester	1	2.6. Type of evaluation	C	2.7 Course framework	O

C – colloquium; O – optional

3. Estimated total time of teaching activities (hours per semester)

3.1 Hours per week	4	Out of which: 3.2 Lectures	2	3.3 Seminars / Laboratory classes	2
3.4 Total hours in the curriculum	48	Out of which: 3.5 Lectures	24	3.6 Seminars / Laboratory classes	24

Allocation of study time:	hrs
Study supported by textbooks, other course materials, recommended bibliography and personal student notes	30
Additional learning activities in the library, on specialized online platforms and in the field	24
Preparation of seminars / laboratory classes, topics, papers, portfolios and essays	24
Tutoring	16
Examinations	4
Other activities: -	-

3.7 Individual study (total hours)	98
3.8 Total hours per semester	146
3.9 Number of credits	20

4. Preconditions (where applicable)

4.1 Curriculum	• Not applicable
4.2 Competences	• Skills in using laboratory equipment • Interpretation of physical, chemical and biological data

5. Conditions (where applicable)

5.1 Conducting lectures	• Audio-video logistics, whiteboard
5.2 Conducting seminars / laboratory classes	• Admission at colloquium evaluation is conditioned by at least 50% attendances at the scheduled seminars.

6. Specific competences acquired

Professional competences	• Gaining conceptual and analytical capacity to approach the molecular study of biodiversity. • Obtaining practical skills to use analysis equipment and biological databases for integrated biodiversity investigation; • Developing the capacities of doctoral graduates to organize and carry out complex activities in biotechnology, biochemistry, cellular and molecular biology, genetics research laboratories • Development of communication skills for writing scientific papers with interdisciplinary and biological subjects.
Transversal competences	• Acquiring advanced biological knowledge essential for an interdisciplinary approach to the topic covered in the doctoral thesis; • Using theoretical concepts in solving practical problems.

7. Course objectives (based on the acquired competencies grid)

7.1 The general objective of the course	• Gaining advanced knowledge of qualitative and quantitative analysis of the diversity of living prokaryotic and eukaryotic systems
7.2 Specific objectives	• Developing the capacity of PhD students to explore biodiversity through molecular means. • Learning the methodological principles underlying molecular techniques for investigating the diversity of prokaryotes and eukaryotes.

8. Content

8.1 Lectures	Teaching methods	Comments
Introduction to environmental molecular biology: definition, purpose, importance and directions of application	Presentation, discussion, case studies, exercises	2 hours
The evolution of life, organization and diversity of living systems.		2 hours
The role of biodiversity in the biogeochemical cycles of the major elements.		2 hours
Principles of molecular taxonomy. The use of DNA analysis in the molecular identification of species.		2 hours
Principles of genomic analysis; genomic projects. Complete genome sequencing strategies; types of sequencing strategies		4 hours
Functional and proteomic genomics techniques in investigating the diversity and functionality of organisms.		4 hours
Analysis of biodiversity and functionality of ecosystems through metagenomics and metaproteomics. The role of biological databases and bioinformatics tools in the molecular analysis of biodiversity.		8 hours
		Total: 24 hours
Bibliography:		

Bouchez, T., Blieux, A. L., Dequiedt, S., Domaizon, I., Dufresne, A., Ferreira, S. et al. (2016). Molecular microbiology methods for environmental diagnosis. Environ Chem Lett, 14 (4), 423-441.
Garte, S. J. (1993). Molecular environmental Biology. CRC Press, Boca Raton, USA.
Craig N.L., Cohen-Fix O., Green R.(2010). Molecular biology: principles of genome function. Oxford University Press, Oxford, UK.
Liu, W.- T.,Jansson, J. K. (2010). Environmental Molecular Microbiology. Caister Academic Press, Urbana-Champaign, USA.
Martin, C.C. (2008), Environmental Genomics. Humana Press, Totowa, NJ, USA.
Watson J.D., Baker T.A., Bell S.P. (2008). Molecular biology of the gene. Cold Spring Harbor Laboratory Press.

8.2 Seminars / laboratory classes	Teaching methods	Comments
Laboratory organization and labor protection instructions.	Group seminar	1 hour
Practical work in modular regime: direct and fluorescence optical microscopy	Practical work. Problem-solving and discussion	5 hours
Total genomic DNA extraction from bacterial isolates, DNA quantification, PCR amplification of the 16S rRNA gene, gel separation of amplicons.	Practical work. Problem-solving and discussion	6 hours
Total environmental DNA extraction, quantitative and qualitative assessment of extracted envDNA.	Practical work. Problem-solving and discussion	6 hours
Use of sequence data for molecular identification of microbial species. Presentation of metagenomic analysis strategies and tools for characterizing the molecular diversity of an environmental sample.	Practical work. Problem-solving, data integration, data modeling and discussion	4 hours
Colloquium for the evaluation of the elaborated reports and of the assimilated knowledge during the laboratory sessions	Frontal evaluation activity based on heuristic conversation	2 hours
		Total: 24 hours

Bibliography:

(1) Scientific articles from public databases (PubMed Central, Google Academic, SpringerLink, etc.) accessible through `Lucian Blaga` Central University Library of Cluj-Napoca and ANELIS
(2) Biological databases (eg, Entrez-GenBank) accessible through the branch libraries of the `Lucian Blaga` Central University Library of Cluj-Napoca.

9. Aligning the contents of the discipline with the expectations of the epistemic community representatives, professional associations and standard employers operating in the program field

- The course has a similar content to courses from other European universities and considers the level of training of doctoral students
- The course is essential for the development of working skills in interdisciplinary and applied (biotechnology) research laboratories.

10. Examination

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final grade
10.4 Lectures	Assessment of knowledge	Colloquium (oral)	50%
10.5 Seminars / laboratory classes	Skills in understanding and reviewing the latest scientific information	Colloquium (oral)	30%

	Skills in presenting scientific information	Evaluation of presentation	20%
10.6 Minimum performance standard			
• Knowledge of 50% of the information content of the course • Knowledge of 50% of the information content of the laboratory work.			

Date of issue
17.09.2018

Signature of the teacher responsible for lectures
Prof. Horia Banciu

Signature of the teacher responsible for seminars
Prof. Horia Banciu

Date of approval by the doctoral school council
18.09.2018

Signature of the doctoral school director
Prof. Marcel Pârvu