

SYLLABUS

Academic year 2024 - 2025

1. Details about the program

1.1. Higher Education Institution	„Lucian Blaga” University of Sibiu
1.2. Faculty	Faculty of Sciences
1.3. Department	Environmental Sciences, Physics, Physical Education and Sports
1.4. Field of study	BIOLOGY
1.5. Study cycle ¹	BACHELOR
1.6. Specialization	BIOLOGY

2. Details about the course

2.1. Course name	Methods of biological data analysis			Code	FSTI.MFE.BIOEN.L.SO.3.10 20.C-4.7	
2.2. Course coordinator	Assoc. Prof. Ana Maria Benedek-Sîrbu, PhD					
2.3. Practical activity coordinator	Assoc. Prof. Ana Maria Benedek-Sîrbu, PhD					
2.4. Year of study ²	2	2.5. Semester ³	3	2.6. Type of assessment ⁴	C	
2.7. Type of discipline ⁵	O	2.8. Formative category of the discipline ⁶				S

3. Estimated total time

3.1. Proportion of the discipline within the curriculum – <i>number of hours / week</i>					
3.1.a.Lecture	3.1.b. Seminar	3.1.c. Laboratory	3.1.d. Project	3.1.e Other	Total
1	-	2	-	-	3
3.2. Proportion of the discipline within the curriculum – <i>number of hours / week</i>					
3.2.a.Lecture	3.2.b. Seminar	3.2.c. Laboratory	3.2.d. Project	3.2.e Other	Total ⁷
14	-	28	-	-	42
Allocation of time budget for individual study⁸					No. hours
Study based on textbook, lecture notes, bibliography and course notes					14
Additional research: library, specialized electronic platforms and field or on-site investigation and documentation					15
Preparing for the seminar / laboratorires, home assignments, reports, portfolios and essays					15
Tutoring ⁹					10
Examinations ¹⁰					4
3.3. Total number of hours for individual study¹¹ (NOSI_{sem})					58
3.4. Total number of hours in the curriculum (NOAD_{sem})					42
3.5. Total number of hours per semester¹² (NOAD_{sem} + NOSI_{sem})					100
3.6. No of hours / ECTS					25
3.7. Number of credits¹³					4

4. Prerequisites (if applicable)

4.1. Prerequisite courses for enrollment to this subject (from the curriculum) ¹⁴	
4.2. Competencies	

5. Requirements (wherever applicable)

5.1. Lecture organization and structure ¹⁵	Room with videoprojector
5.2. Organization and structure of practical activities (lab/sem/pr/other) ¹⁶	Computer room

6. Specific competencies¹⁷

Number of credits assigned to the discipline ¹⁸			4	Distribution of credits according to competencies ¹⁹
6.1. Professional competencies	CP1	Define the basic concepts, theories and methods in the field of experimental design and data analysis in order to facilitate the connections required in the field of biology		1
	CP2	Ability to elaborate and interpret statistical models		0.5
	CP3	Analyse and communicate scientific information.		0.5
	CP4	Ability to use different types of ANOVA, depending on the experimental design, the regression and correlation analysis, to elaborate simple and multiple linear models on different types of biological data sets.		1
6.2. Transversal competencies	CT1	Implementation of effective and responsible work strategies, punctuality, reliability and personal responsibility, based on principles, norms and values of professional ethics code.		0.25
	CT2	Efficient work in multidisciplinary team on different hierarchical levels		0.25
	CT3	Documentation in English language for professional and personal development through training and effective adaptation to new scientific discoveries		0.5

7. Course objectives (reflected by the framework of specific competencies)

7.1. General objective	Develop the ability to analyse biological data sets using R software.
7.2. Specific objectives	<ul style="list-style-type: none"> • Develop the ability to elaborate and implement sampling designs in hypothetic-deductiv studies. • Definition and correct use of controls and treatments, avoidance of pseudoreplication. • Presentation and use of the basic methods of biological data illustration, statistical analysis and interpretation. • Use of R software to transform, illustrate and analyse biological data

8. Course description

8.1. Lecture ²⁰		Teaching methods ²¹	No. of hours
Lecture 1	The strategy of elaboration and implementation of biological studies	Interactive lecture, explanation, conversation, problematisation	2
Lecture 2	Introduction in experimental design	Interactive lecture, explanation, conversation, problematisation	2
Lecture 3	Hypothesis testing	Interactive lecture, explanation, conversation, problematisation	2
Lecture 4	Different types of experimental designs	Interactive lecture, explanation, conversation, problematisation	2
Lecture 5	Linear corellation and simple regression	Interactive lecture, explanation, conversation, problematisation	2
Lecture 6	Multiple linear regression. Choosing the best model.	Interactive lecture, explanation, conversation, problematisation	2
Lecture 7	Illustrating, interpreting and reporting results	Interactive lecture, explanation, conversation, problematisation	2
Total number of lecture hours:			14

8.2. Practical activities (8.2.a. Seminar ²² / 8.2.b. Laboratory ²³ / 8.2.c. Project ²⁴ / 8.2.d. Other practical activities ²⁵)	Teaching methods	No. of hours
Lab. 1. Introduction to R	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	4
Lab. 2. Preliminary data analysis and illustration	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	4
Lab. 3. Introduction to statistical analysis	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	2
Lab. 4. t tests. Verifying t-test assumptions	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	2
Lab. 5. Z tests for proportions, chi-square tests for independence and goodness of fit	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	2
Lab. 6. ANOVA for different types of experimental designs	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	4
Lab. 7. Linear correlation	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	2
Lab. 8. Simple linear regression	Explanation, conversation, problematisation, dialogue,	2

	brainstorming, case studies, use of computer, problem solving	
Lab. 9. Multiple linear regression. Choosing the best model	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	2
Lab. 10. Non-parametric tests	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	2
Lab. 11. Recap	Explanation, conversation, problematisation, dialogue, brainstorming, case studies, use of computer, problem solving	2
Total number of hours: laboratory		28

9. Bibliography

9.1. Recommended references	1. Krebs, Ch., 1989 - Ecological Methodology. Harper Collins Publishers.
	2. Venables, W.N., Smith, D.M., the R Core Team, 2018 - An Introduction to R. CRAN.R – project.org
9.2. Additional references	1. Faraway, J.J., 2002 – Practical Regression and ANOVA in R. CRAN.R – project.org

10. Correlating the course description with the expectations and requirements of representatives of the epistemic community, professional associations and significant employers and stakeholders related to the study program and the specific area²⁶

The course content enables students to obtain skills of understanding and reproduction of the terms, concepts and principles of experimental design and analysis of biological data, gives them the ability to communicate using the specific scientific language and to elaborate adequate experimental designs for different research questions, and to elaborate statistical models on different types of biological datasets. It stimulates the participation in collective work / research and professional development of original ideas.

11. Evaluation

Type of activity	11.1 Assessment criteria	11.2 Assessment methods		11.3 Percentage of the final grade	Notes. ²⁷
11.4a Exam / Coloquium	• Theoretical and practical knowledge (quantity, correctness, accuracy)	Midterm / ongoing assignments ²⁸ :	%	50%	
		Home assignments:	%		
		Other activities ²⁹ :	%		
		Final assessment:	100%		
11.4c Laboratory	• Knowledge of equipment, methods of using specific instruments and tools; assessment of tools or achievements, processing and interpretation of results	• Practical exam		50%	
11.5 Minimum performance standard ³⁰					

- | | |
|---|--|
| - students are expected to know the main methods of data analysis and their usage and assumptions and be able to apply and interpret a simple linear regression | |
|---|--|

The course description includes components adapted to SEN (Special Educational Needs) persons, according to their type and degree, at all curricular elements and dimensions (competencies, objectives, course description, teaching methods, alternative assessment), in view of providing and ensuring equitable and fair opportunities to academic education for all students, with special attention to special educational needs.

Date of submission: 15 / 09 / 2024

Date of approval in the Department: 17 / 09 / 2024

	Degree, title, first name, surname	Signature
Course coordinator	Assoc. Prof. Ana-Maria Benedek-Sîrbu, PhD	
Study program coordinator	Assoc. Prof. Ana-Maria Benedek-Sîrbu, PhD	
Director Department	Lecturer Ioan Tăușan, PhD	

¹ Licență / Master

² 1-4 pentru licență, 1-2 pentru master

³ 1-8 pentru licență, 1-3 pentru master

⁴ Examen, colocviu sau VP A/R – din planul de învățământ

⁵ Regim disciplină: O=Disciplină obligatorie; A=Disciplină opțională; U=Facultativă

⁶ Categoria formativă: S=Specialitate; F=Fundamentală; C=Complementară; I=Asistată integral; P=Asistată parțial; N=Neasistată

⁷ Este egal cu 14 săptămâni x numărul de ore de la punctul 3.1 (similar pentru 3.2.a.b.c.d.e.)

⁸ Liniile de mai jos se referă la studiul individual; totalul se completează la punctul 3.37.

⁹ Între 7 și 14 ore

¹⁰ Între 2 și 6 ore

¹¹ Suma valorilor de pe liniile anterioare, care se referă la studiul individual.

¹² Suma (3.5.) dintre numărul de ore de activitate didactică directă (NOAD) și numărul de ore de studiu individual (NOSI) trebuie să fie egală cu numărul de credite alocate disciplinei (punctul 3.7) x nr. ore pe credit (3.6.)

¹³ Numărul de credit se calculează după formula următoare și se rotunjește la valori vecine întregi (fie prin micșorare fie prin majorare)

$$\text{Nr. credite} = \frac{\text{NOCpSpD} \times C_C + \text{NOApSpD} \times C_A}{\text{TOCpSdP} \times C_C + \text{TOApSdP} \times C_A} \times 30 \text{ credite}$$

Unde:

- NOCpSpD = Număr ore curs/săptămână/disciplina pentru care se calculează creditele
- NOApSpD = Număr ore aplicații (sem./lab./pro.)/săptămână/disciplina pentru care se calculează creditele
- TOCpSdP = Număr total ore curs/săptămână din plan
- TOApSdP = Număr total ore aplicații (sem./lab./pro.)/săptămână din plan
- C_C/C_A = Coeficienți curs/aplicații calculate conform tabelului

Coeficienți	Curs	Aplicații (S/L/P)
Licență	2	1
Master	2,5	1,5
Licență lb. străină	2,5	1,25

¹⁴ Se menționează disciplinele obligatoriu a fi promovate anterior sau echivalente

¹⁵ Tablă, videoprojector, flipchart, materiale didactice specifice, platforme on-line etc.

¹⁶ Tehnică de calcul, pachete software, standuri experimentale, platforme on-line etc.

¹⁷ Competențele din Grilele aferente descrierii programului de studii, adaptate la specificul disciplinei

¹⁸ Din planul de învățământ

¹⁹ Creditele alocate disciplinei se distribuie pe competențe profesionale și transversale în funcție de specificul disciplinei

²⁰ Titluri de capitole și paragrafe

²¹ Expunere, prelegere, prezentare la tablă a problematicii studiate, utilizare videoprojector, discuții cu studenții (pentru fiecare capitol, dacă este cazul)

²² Discuții, dezbateri, prezentare și/sau analiză de lucrări, rezolvare de exerciții și probleme etc.

²³ Demonstrație practică, exercițiu, experiment etc.

²⁴ Studiu de caz, demonstrație, exercițiu, analiza erorilor etc.

²⁵ Alte tipuri de activități practice specifice

²⁶ Legătura cu alte discipline, utilitatea disciplinei pe piața muncii

²⁷ CPE – condiționează participarea la examen; nCPE – nu condiționează participarea la examen; CEF - condiționează evaluarea finală; N/A – nu se aplică

²⁸ Se va preciza numărul de teste și săptămânile în care vor fi susținute.

²⁹ Cercuri științifice, concursuri profesionale etc.

³⁰ Se particularizează la specificul disciplinei standardul minim de performanță din grila de competențe a programului de studii, dacă este cazul.