

SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babeş-Bolyai University of Cluj-Napoca
1.2 Faculty	Environmental Science and Engineering
1.3 Department	Environmental Analysis and Assessment
1.4 Field of study	Environmental Engineering
1.5 Study cycle	Bachelor
1.6 Study programme / Qualification	Environmental Engineering

2. Information regarding the discipline

2.1 Name of the discipline	Statistic and Data Processing, Cod NLR4312						
2.2 Course coordinator	CS III PhD Mereuță Alexandru						
2.3 Seminar coordinator	CS III PhD Mereuță Alexandru						
2.4. Year of study	I	2.5 Semester	II	2.6. Type of evaluation	C	2.7 Type of discipline	DC.Obl

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					20
Additional documentation (in libraries, on electronic platforms, field documentation)					15
Preparation for seminars/labs, homework, papers, portfolios and essays					2
Tutorship					3
Evaluations					2
Other activities:					-
3.7 Total individual study hours	42				
3.8 Total hours per semester	98				
3.9 Number of ECTS credits	4				

4. Prerequisites (if necessary)

4.1. curriculum	-
4.2. competencies	-

5. Conditions (if necessary)

5.1. for the course	classroom equipped with blackboard, video projector and laptop
5.2. for the seminar /lab activities	Seminar room with computer for each student

6. Specific competencies acquired

Professional competencies	1. Acquiring theoretical and practical knowledge for choosing study samples and applying statistical tests depending on the specifics of the study and data 2. The structure of the course/laboratory offers the possibility of developing computer operating skills by using specific programs for statistical data processing (GraphPad Prism, IBM SPSS, Microsoft Excel) 3. Application of study methods appropriate to the research problems formulated 4. Data preparation, systematization and representation 5. Application of parametric statistical tests (t-test, one-way ANOVA, two-way ANOVA, ANCOVA) or nonparametric (Mann-Whitney U test, Wilcoxon Rank-Sum test, Kruskal-Wallis test) according to the specifics of the data. 6. Multivariate analysis
Transversal competencies	1. Ability to understand and perform statistical analysis 2. Use of acquired notions for statistical processing (descriptive and inferential) of experimental data in the field of the environment

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

7.1 General objective of the discipline	knowledge, understanding and deepening of the notions of inferential statistics (sampling methods, the steps necessary for applying a statistical test, the formulation of statistical hypotheses, the level of significance, etc.)
7.2 Specific objective of the discipline	development of deductive reasoning skills developing the skills to operate with programs specific to statistical data processing (GraphPad Prism, Excel, SPSS) application and deepening of the notions learned in the Applied Informatics course

8. Content

8.1 Course	Teaching methods	Remarks
1. Recapitulation of the notions of descriptive statistics. Introduction to inferential statistics. The Importance of the Normal Distribution in Inferential Statistics	Participatory lecture, dialogue, presentation	
2. Preliminary analysis of statistical data with the help of GraphPad Prism and SPSS programs. Detection of excessive values. Variance homogeneity	Participatory lecture, dialogue, presentation	
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4. Formulation of statistical hypotheses. Types of errors. Level of significance	Participatory lecture, dialogue, presentation	

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6. Power analysis. Statistical test strength and effect size	Participatory lecture, dialogue, presentation	
7. Parametric statistical tests (one-way ANOVA test and posthoc analysis)	Participatory lecture, dialogue, presentation	
8. Nonparametric statistical tests (Hi square test, Mann-Whitney Wilcoxon, Kruskal-Wallis). Using ranks	Participatory lecture, dialogue, presentation	
9. Association tests (Pearson, Spearman, Kendall). Partial and semi-partial correlation	Participatory lecture, dialogue, presentation	
10. Choosing statistical tests depending on the objective of the study and the specifics of the data. Applications with reference to studies in the field of environmental engineering	Participatory lecture, dialogue, presentation	
11. Carrying out research projects in compliance with the principles of inferential statistics (I)	Dialogue, exposition	
12. Carrying out research projects in compliance with the principles of inferential statistics (II)	Dialogue, exposition	
13. Review for Written Assessment	Participatory lecture, dialogue, presentation	
14. Colloquium	Assessment	
Bibliography: Berthouex P., Brown L., (2002), Statistics for environmental engineers, Lewis Publishers, 463 pg. Brase C.H., Brase C.P., (2007), Understanding basic statistics, Houghton Mifflin Co., New York, 526 pg. Chap T. Le (2003), Introductory biostatistics, John Wiley & Sons, 553 pg. Clocotici V., Stan A., (2000), Statistică aplicată în psihologie, Iași, Ed. Polirom, 296 pg. Dicu T. – Statistica inferențială cu aplicații în domeniul mediului (suport curs - CD) Field A., (2017), Discovering statistics using IBM SPSS statistics, 5th edition, Ed. Sage, 1104 pg. Jaba E., Grama A., (2004), Analiza statistică cu SPSS sub Windows, București, Ed. Polirom, 267 pg. Manly B., (2000), Statistics for Environmental Science and Management, Chapman & Hall/CRC, 323 pg. Mărușteru M., (2005), Biostatistică, Tîrgu-Mureș, Univ. Medicină și Farmacie. Mckillup S., Darby M., (2010), Geostatistics explained: An introductory guide for earth scientists, Cambridge University Press, 396 pg. Montgomery D., Runger G., (2002), Applied statistics and probability for engineers, John Wiley & Sons, 784 pg. Norusis M., (2006), SPSS 15.0 Guide to Data Analysis, Prentice Hall, 651 pg. Popa M., (2010), Statistici multivariate, Iași, Ed. Polirom, 358 pg. Salcedo J., McCormick K., (2020), SPSS Statistics for dummies, 4th edition, 480 pg.		
8.2 Seminar / laboratory	Teaching methods	Remarks
1. Recapitulation of the notions of descriptive statistics. The coefficient of asymmetry and vaulting within the data distribution	Dialogue, computer exercise	
2. Using GraphPad Prism for statistical data processing	Dialogue, computer exercise	
3. Determination of excess values using the Grubb test, the quartile method or the ROUT test	Dialogue, computer exercise	
4. Estimation of the parameters of a population. Determination of the confidence interval using GraphPad Prism and M. Excel	Dialogue, computer exercise	

5. The level of significance and the relationship to the confidence interval. Applications in GraphPad Prism and M. Excel. Application of parametric statistical tests (z, t)	Dialogue, computer exercise	
6. Using the GPower program to determine test power, sample size, etc.	Dialogue, computer exercise	
7. Applied parametric statistical tests (ANOVA) in GraphPad Prism	Dialogue, computer exercise	
8. Application of nonparametric statistical tests (Hi square test, McNemar, Mann-Whitney Wilcoxon, Kruskal-Wallis) in GraphPad Prism and M. Excel	Dialogue, computer exercise	
9. Use of the SPSS program for data entry, representation and statistical processing	Dialogue, computer exercise	
10. Parametric and nonparametric statistical tests in SPSS	Dialogue, computer exercise	
11. Multiple linear regression with the help of the SPSS program	Dialogue, computer exercise	
12. Case study – radon and lung cancer. Application of descriptive and inferential statistics elements in SPSS	Dialogue, computer exercise	
13. Computer-Based Assessment Recap	Dialogue, computer exercise	
14. Verifying the notions acquired in L1 – L13	Assessment	
Bibliography: Berthouex P., Brown L., (2002), Statistics for environmental engineers, Lewis Publishers, 463 pg. Brase C.H., Brase C.P., (2007), Understanding basic statistics, Houghton Mifflin Co., New York, 526 pg. Dicu T. – Statistica inferențială cu aplicații în domeniul mediului (suport lucrări de laborator - CD) Field A., (2017), Discovering statistics using IBM SPSS statistics, 5th edition, Ed. Sage, 1104 pg. Jaba E., Grama A., (2004), Analiza statistică cu SPSS sub Windows, București, Ed. Polirom, 267 pg. Manly B., (2000), Statistics for Environmental Science and Management, Chapman & Hall/CRC, 323 pg. Mărușteru M., (2005), Biostatistică, Tîrgu-Mureș, Univ. Medicină și Farmacie. Mckillup S., Darby M., (2010), Geostatistics explained: An introductory guide for earth scientists, Cambridge University Press, 396 pg. Montgomery D., Runger G., (2002), Applied statistics and probability for engineers, John Wiley, 784 pg. Reimann C., Filzmoser P., Garrett R., Dutter R., (2008), Statistical Data Analysis Explained - Applied Environmental Statistics with R, John Wiley & Sons, 359 pg.		

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 content is in accordance with the curriculum of similar centers in the country and abroad. The structure was made after studying the content of the syllabus of the Faculty of Physics (Babeș-Bolyai University), the Faculty of Economics and Business Administration (Babeș-Bolyai University), the master's program of Bioinformatics and Biostatistics (University of Medicine and Pharmacy Iuliu Hațieganu) or the one of Bioinformatics and Biostatistics (University of Medicine and Pharmacy Iuliu Hațieganu), the course of Statistics and Data Processing (University of Bremen). Also, the global trend towards electronic learning

platforms such as Coursera, Udemy, Lynda, etc. has allowed an update of the content, including in the form of videos containing clues regarding the resolution of the exercises.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Knowledge of the concepts presented in the course	Written evaluation	30%
10.5 Seminar/lab activities	Checking the skills of solving the exercises with the help of the addressed programs	Computer-based assessment	60%*
10.6 Minimum performance standards			
Use of basic functions in statistical data processing programs			

*1 point will be added to the final grade ex officio.

Date 15.11.2024

Signature of course coordinator

Signature of seminar coordinator



Date of approval

Signature of the head of department