

SYLLABUS

Applied Statistics

University year 2025-2026

1. Information regarding the programme

1.1. Higher education institution	Babeş-Bolyai University
1.2. Faculty	Mathematics and Computer Science
1.3. Department	Mathematics
1.4. Field of study	Mathematics
1.5. Study cycle	Master
1.6. Study programme/Qualification	Advanced Mathematics
1.7. Form of education	full-time study

2. Information regarding the discipline

2.1. Name of the discipline		Applied Statistics				Discipline code		MME3161
2.2. Course coordinator		Assoc. Prof. PhD Habil. Hannelore Lisei						
2.3. Seminar coordinator		Assoc. Prof. PhD Habil. Hannelore Lisei						
2.4. Year of study	2	2.5. Semester	4	2.6. Type of evaluation	E	2.7. Discipline regime		Optional

3. Total estimated time (hours/semester of didactic activities)

3.1. Hours per week	3	of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4. Total hours in the curriculum	36	of which: 3.5 course	24	3.6 seminar/laborator	12
Time allotment for individual study (ID) and self-study activities (SA)					hours
Learning using manual, course support, bibliography, course notes (SA)					60
Additional documentation (in libraries, on electronic platforms, field documentation)					50
Preparation for seminars/labs, homework, papers, portfolios and essays					40
Tutorship					19
Evaluations					20
Other activities:					0
3.7. Total individual study hours	189				
3.8. Total hours per semester	225				
3.9. Number of ECTS credits	9				

4. Prerequisites (if necessary)

4.1. curriculum	Mathematical Analysis, Probability Theory, Statistics
4.2. competencies	Computing limits and integrals, Combinatorics

5. Conditions (if necessary)

5.1. for the course	Classroom with blackboard/video projector
5.2. for the seminar /lab activities	Classroom with blackboard/video projector

6.1. Specific competencies acquired ¹

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.

Professional/essential competencies	<p>C1.1. Identify concepts, describe theories and use specific language.</p> <p>C2.3. Apply theoretical methods of analysis appropriate to the given problem</p>
Transversal competencies	<p>CT1. Apply the rules for well-organised and efficient work, for responsible attitude to didactics and science, for creative development of one's own potential, respecting the principles and norms of professional ethics.</p>

6.2. Learning outcomes

Knowledge	<p>The student:</p> <ul style="list-style-type: none"> - has acquired the specialised knowledge in mathematics-related subjects required to solve study tasks; - knows the basic concepts of applied statistics, as well as methods for their application in mathematics and computer science-related scientific fields
Skills	<p>The student is able to</p> <ul style="list-style-type: none"> - construct clear and well-reasoned mathematical arguments to explain mathematical problems, topics and ideas in writing - explore mathematical content independently, drawing on previously learnt ideas and tools to extend his/her knowledge.
Responsibility and autonomy:	<p>The student has the ability to work independently, to develop mathematical thinking, moving from a procedural/computational understanding of mathematics to a comprehensive understanding that includes logical reasoning, generalisation, abstraction and formal proof.</p>

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

7.1 General objective of the discipline	The course aims to deepen the notions of Statistics, followed by their applicative side and their practical interpretation.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> • Predictive models and their performance • Methods of statistical testing • Application of Monte Carlo methods • Regression models

8. Content

8.1 Course	Teaching methods	Remarks
C1. Review - notions of Probability Theory	Lecture, description, explanation	
C2. The moment generating function	Exposure, description, explanation, examples	

C3. The multivariate normal distribution	Exposure, description, explanation, examples	
C4. Results from estimation theory	Exposure, description, explanation, examples	
C5. Inference for distributions	Exposure, description, explanation, examples	
C6. Nonparametric techniques I	Exposure, description, explanation, proof	
C7. Nonparametric techniques II	Exposure, description, explanation, proof, examples	
C8. Correlation Analysis	Exposure, description, explanation, proof	
C9. Regression models I	Exposure, description, explanation	
C10. Regression models II	Exposure, description, explanation	
C11. Statistical performance	Exposure, description, explanation	
C12. Statistical evaluations	Exposure, description, explanation	
Bibliography <ul style="list-style-type: none"> • DasGupta, A., Asymptotic Theory of Statistics and Probability, New York, Springer Science+Business Media, LLC, 2008. • Dekking F.M., A modern introduction to probability and statistics: understanding why and how, London, Springer, 2005. • Lisei, H., Probability Theory, Casa Cărții de Știință, Cluj-Napoca, 2004. • Lisei, H., Grecksch, W., Iancu, M., Probability: Theory, Examples, Problems, Simulations. World Scientific Publishing, Singapore, 2020. • Morariu, C. O., Probabilități și statistică aplicată, Editura Universității "Transilvania", Brașov, 2010. • Shao, J., Mathematical statistics, New York, Springer, 2003. 		
8.2 Seminar / laboratory	Teaching methods	Remarks
S1. Solving problems from Probability Theory and Statistics	Presentation, discussion	
S2. Mathematical methods for generating random data	Discussion, group-based work, modelling	
S3. Stochastic processes	Discussion, group-based work, modelling	
S4. Regression models	Discussion, group-based work, modelling	
S5. Bootstrap methods	Discussion, group-based work, modelling	
S6. Project presentations / discussing homeworks	Discussion, group-based work, modelling	
Bibliography <ul style="list-style-type: none"> • DasGupta, A., Asymptotic Theory of Statistics and Probability, New York, Springer Science+Business Media, LLC, 2008 • Dekking F. M., A modern introduction to probability and statistics: understanding why and how, London, Springer, 2005. • Lisei, H., Probability Theory, Casa Cărții de Știință, Cluj-Napoca, 2004. • Lisei, H., Grecksch, W., Iancu, M., Probability: Theory, Examples, Problems, Simulations. World Scientific Publishing, Singapore, 2020. • Moore, D. S., The basic practice of statistics, New York, W. H. Freeman, 2007. • Morariu, C. O., Probabilități și statistică aplicată, Editura Universității "Transilvania", Brașov, 2010. 		


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 of this discipline is in accordance with the curricula of the most important universities in Romania and abroad, where advanced mathematics and its applications play an essential role.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of final grade
10.4 Course	Knowledge of the main concepts presented in the course	Final exam	65%
10.5 Seminar/laboratory	To be able to solve specific problems using statistical inference	Continuous observation during the semester; active participation at the seminars, project presentation /homeworks	35%
10.6 Minimum standard of performance			
At least grade 5 (on a scale of 1 to 10) at the written exam. The student should be able to perform specific reasoning, to use statistical inference and its predictive methods.			

11. Labels ODD (Sustainable Development Goals)²

	General label for Sustainable Development							
								

Date:
11.04.2025

Signature of course coordinator

Assoc. Prof. PhD Habil. Hannelore Lisei

Signature of seminar coordinator

Assoc. Prof. PhD Habil. Hannelore Lisei

Date of approval:
25.04.2025

Signature of the head of department

Prof. dr. Andrei Mărcuș

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.”.