

## COURSE DESCRIPTION

### Applied Statistics

Academic year 2026-2027

#### 1. Programme-related data

1.1. Higher Education Institution	Babeş-Bolyai University
1.2. Faculty	Mathematics and Computer Science
1.3. Department	Mathematics
1.4. Field	Mathematics
1.5. Level of study	Master
1.6. Degree programme / Qualification	Advanced Mathematics
1.7. Form of education	Full-time study

#### 2. Course-related data

2.1. Course title	Applied Statistics			Course code	<b>MME3161</b>
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 assessment	Exam
2.7. Course status	Optional		2.8. Course type	Specialisation subject	

#### 3. Total estimated time (hours per semester of teaching activities)

3.1. Number of hours per week	3	of which: 3.2. course	2	3.3. seminar/ laboratory/ project	1
3.4. Total of hours in the curriculum	36	of which: 3.5. course	24	3.6. seminar/ laboratory	12
<b>Time allocation for individual study (IS) and self-taught activities (ST)</b>					<b>hours</b>
Learning from textbooks, course materials, bibliography, and notes (IS)					60
Additional research in the library, on subject-specific electronic platforms, and on-site					50
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					40
Tutoring (professional guidance)					19
Examinations					20
Other activities					0
<b>3.7. Total hours of individual study (IS) and self-taught activities (ST)</b>				189	
<b>3.8. Total hours per semester</b>				225	
<b>3.9. Number of credits</b>				9	

#### 4. Prerequisites (where applicable)

4.1. curriculum-related	Mathematical Analysis, Probability Theory, Statistics
4.2. skills-related	Computing limits and integrals, Combinatorics

#### 5. Specific conditions (where applicable)

5.1. course-related	Classroom with blackboard/video projector
5.2. seminar/laboratory-related	Classroom with blackboard/video projector

#### 6.1. Competencies resulting from the completion of the degree programme (as referred to in the curriculum)<sup>1</sup>

<sup>1</sup> The professional and/or transversal skills targeted by the subject for which the course description is prepared will be copied from the curriculum of the degree programme. For each competency, the complete entry, including the competency code, will be copied with the exact wording that appears in the curriculum, without any changes. If no competency is copied from either of the two categories, the row corresponding to that category is deleted from the table.

Professional competencies	
Competency code	Competency
CP3	perform analytical mathematical calculations
CP1	develop problem-solving strategies
Transversal competencies	
Competency code	Competency
CT3	work independently
CT6	think analytically

## 6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)<sup>2</sup>

Learning outcomes targeted by the subject		
Competency code	Knowledge and comprehension	Specific academic skills
CP3	5. The graduate formulates observations and differentiates notions, properties and assertions from advanced disciplines of mathematics through examples and counterexamples.	5. The graduate verifies, on particular cases or by constructing examples or counterexamples, the validity of mathematical statements. The graduate translates a practical situation into mathematical language, solves the problem obtained and interprets the results obtained.
CP1	1. The graduate analyses the hypotheses and conclusions from mathematical assertions and links them within the demonstration.	1. The graduate demonstrates the acquisition and use of effective research methods and techniques.
CT3	3. The graduate compares and distinguishes related notions and their properties from advanced mathematics disciplines in the curriculum.	3. The graduate is able to identify and formulate significant problems which form the basis for further research.
CT6	4. The graduate critically studies the specialized literature, including by using international databases, identifying fundamental concepts.	4. The graduate applies appropriate techniques for solving advanced problems.

## 7. Subject-specific learning outcomes

Knowledge and comprehension
1. The graduate has the necessary knowledge to study specialized literature.
2. The graduate knows fundamental mathematical concepts as well as methods for applying them in fields of science related to mathematics and computer science.
Specific academic skills
1. The graduate is able to construct clear and well-supported mathematical arguments to explain mathematical problems, topics, and ideas in writing.

## 8. Contents

8.1. Course	Teaching and learning methods	Remarks <sup>3</sup>
C1. Review - notions of Probability and Statistics	Lecture, description, explanation	

<sup>2</sup> The learning outcomes relevant to the degree programme and targeted by the subject for which the course description is prepared will be listed. The entries, copied without any changes from the Curriculum by subject type (Core Subject/Specialisation Subject/Complementary Subject), are listed under the corresponding competency.

<sup>3</sup> For example, organisational aspects, recommendations for students, specific aspects relating to the course/seminar, such as inviting experts in the field, etc.

C2. The moment generating function	Exposure, description, explanation, examples	
C3. The multivariate normal distribution	Exposure, description, explanation, examples	
C4. Main 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

- 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.

<b>8.2. Seminar/ laboratory</b>	<b>Teaching and learning methods</b>	<b>Remarks</b>
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	



















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- 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. Evaluation

Type of activity	9.1 Evaluation criteria <sup>4</sup>	9.2 Evaluation methods <sup>5</sup>	9.3 Percentage in the final grade
9.4. Course	Knowledge of the main concepts presented in the course	Final exam	70%
9.5. 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	30%
9.6 Minimum standard for passing			
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.			

## 10. SDG labels (Sustainable Development Goals)<sup>6</sup>

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								No label applies
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Date of entry:  
20.04.2026

Signature of course coordinator

Assoc. Prof. PhD Habil. Hannelore Lisei

Signature of seminar coordinator

Assoc. Prof. PhD Habil. Hannelore Lisei

Date of approval in the department:  
28.04.2026

Signature of the head of department

Prof. dr. Andrei Mărcuș

<sup>4</sup> The evaluation criteria must directly reflect the learning outcomes targeted at the level of the degree programme respectively at the level of the subject. More specifically, the learning outcomes set out in the expected learning outcomes are assessed.

<sup>5</sup> Both final evaluation methods and ongoing evaluation strategies should be established.

<sup>6</sup> Select a single label which, according to the [Implementation of SDG labels in the academic process](#), best matches the subject. If the subject addresses sustainable development in a generic manner (i.e. by presenting/introducing the general framework of sustainable development, etc.), then the Sustainable Development generic label may be applied. If none of the labels describe the subject, select the last option: "No label applies."