COURSE DESCRIPTION

Advanced statistics

Academic year 2025-2026

1. Programme-related data

1.1. Higher Education Institution	Babeș-Bolyai University
1.2. Faculty	Faculty of Psychology and Educational Sciences
1.3. Doctoral School	Applied Cognitive Psychology
1.4. Field of study	Psychology
1.5. Level of study	Doctorate

2. Course-related data

2.1. Course title	**Advanced statistics**			Course code	**SDPCA3**
2.2. Course coordinator	Associate Professor Róbert Balázsi				
2.3. Seminar coordinator	Associate Professor Róbert Balázsi				
2.4. Year of study	I	2.5. Semester	I	2.6. Type of assessment	Viva voce
2.7. Course status	Compulsory			2.8. Course type	Core 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	42	of which: 3.5. course	28	3.6. seminar/ laboratory	**14**
Time allocation for individual study (IS) and self-taught activities (ST)					**hours**
Textbook, course material, recommended reading and class notes-based learning (IS)					46
Additional library research in and on electronic platforms					150
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					46
Tutoring (professional guidance)					4
Assessments					4
Other activities [i.e.: two-way communication with the course coordinator/tutor]					-
3.7. Total hours of individual study (IS) and self-taught activities (ST)				**208**	
3.8. Total hours per semester				**250**	
3.9. Number of credits				**10**	

4. Prerequisites (where applicable)

4.1. curriculum-related	Research design in psychology; Statistics
4.2 skills-related	Computers and software applications – PowerPoint, SPSS, Excel, Mplus.

5. Specific conditions (where applicable)

5.1. course-related	Computer, projector
5.2. seminar/laboratory-related	Computer, projector

6. Subject-specific learning outcomes

Knowledge
1. Understands the concepts of path analysis and structural equation modeling.

2. Identifies path analysis and structural equation modeling techniques that are appropriate for the specified research questions and data.
3. Is familiar with the principles of confirmatory factor analysis, measurement models, and SEM models.
4. Is familiar with the methods for analyzing cross-sectional and longitudinal data with latent variables.
Skills
1. Is able to test structural equation models for identification and data fit using Mplus.
2. Conducts confirmatory factor analysis and SEM analysis incorporating measurement models using Mplus.
3. Analyzes longitudinal data using SEM in Mplus.
4. Reads and critically evaluates scientific articles that test causal relationships in education, psychology, and related fields.
Responsibility and autonomy
1. Applies rigorous and efficient working rules in advanced statistical analysis.
2. Shows responsible attitudes toward the scientific and teaching fields, while respecting the principles and norms of professional ethics.
3. Effectively uses information sources and assisted communication and professional training resources, in Romanian and in an international language.

7. Contents

7.1. Course	**Teaching and learning methods**	**Remarks[1]**
1. Introductory course	Lecture, presentation, discussions	
2. Path analysis: mediation and moderation relationships	Lecture, presentation, discussions	
3. SEM modeling: overview	Lecture, presentation, discussions	
4. Confirmatory factor analysis I: theoretical foundations and model specification	Lecture, presentation, discussions	
5. Confirmatory factor analysis II: fit indices	Lecture, presentation, discussions	
6. Confirmatory factor analysis III: hierarchical and bifactor measurement models	Lecture, presentation, discussions	
7. Measurement invariance	Lecture, presentation, discussions	
8. SEM models with latent variables I: practical aspects, model modification, and missing data	Lecture, presentation, discussions	
9. SEM models with latent variables II: mediation analysis	Lecture, presentation, discussions	
10. SEM models with latent variables III: analysis of moderation using the multi-group technique	Lecture, presentation, discussions	
11. The issue of causality in longitudinal research designs	Lecture, presentation, discussions	
12. Autoregressive models with latent variables	Lecture, presentation, discussions	
13. Latent means and latent growth models	Lecture, presentation, discussions	
14. Reporting SEM analysis results	Lecture, presentation, discussions	

[1] For example, organisational aspects, recommendations for students, specific aspects relating to the course/seminar, such as inviting experts in the field, etc.

Bibliography

1. Cohen, J & Cohen, P. (1983) Applied multiple regression/correlation analysis for behavioral sciences. Lawrence Erlbaum Associates, Hillsdale, New Jersey.
2. Kline, R. B. (2004). Principles and practice of structural equation modeling (Second Edition). New York: Guilford Press.
3. Brown, T. A. (2006). Confirmatory Factor Analysis for Applied Research. New York: Guilford Press.
4. Geisser, C. (2020). Longitudinal structural equation modeling with Mplus. New York: Guilford Press.
5. Byrne, B. M. (2001). Structural equation modeling with Mplus: Basic concepts, applications, and programming. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

7.2. Seminar/ laboratory	**Teaching and learning methods**	**Remarks**
1. Introduction to statistical modeling software	Problem solving, statistical modelling	
2. Path analysis: applications	Problem solving, statistical modelling	
3. SEM modeling: applications	Problem solving, statistical modelling	
4. Confirmatory factor analysis I: applications	Problem solving, statistical modelling	
5. Confirmatory factor analysis II: applications	Problem solving, statistical modelling	
6. Confirmatory factor analysis III: applications	Problem solving, statistical modelling	
7. Measurement invariance: applications	Problem solving, statistical modelling	
8. SEM models with latent variables I: applications	Problem solving, statistical modelling	
9. SEM models with latent variables II: applications	Problem solving, statistical modelling	
10. SEM models with latent variables III: applications	Problem solving, statistical modelling	
11. The issue of causality in longitudinal research designs: applications	Problem solving, statistical modelling	
12. Autoregressive models with latent variables: applications	Problem solving, statistical modelling	
13. Latent means and latent growth models: applications	Problem solving, statistical modelling	
14. Reporting SEM analysis results: applications	Problem solving, statistical modelling	

8. Assessment

Type of activity	8.1 Evaluation criteria[2]	8.2 Evaluation methods[3]	8.3 Percentage in the final grade
8.4. Course	Course material-based applied project	Project	80%
8.5. Seminar/ laboratory	Seminar material-based applied project	Project	20%
8.6 Minimum standard for passing			
Demonstrates a sound understanding of the core theoretical and practical aspects of the course. Presents and discusses the required assignments			

[2] 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.

[3] Both final evaluation methods and ongoing evaluation strategies should be established.

9. SDG labels (Sustainable Development Goals)[4]

	○	Sustainable Development Generic Label

								
○	○	○	○	○	○	○	○	○
								No label applies
○	○	○	○	○	○	○	○	○

Date of entry:
April 2026

Signature of course coordinator

Associate Professor Róbert Balázsi

Signature of seminar coordinator

Associate Professor Róbert Balázsi

Date of approval in the department:
April 2026

Signature of the head of department

Professor Oana Benga

[4] 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."*