



COURSE DATASHEET

Semester:	2025/26/2
Course:	Advanced methods in quantitative research I.
Code:	PEDIECON118
Responsible department:	
Department code:	DIGDI
Responsible instructor:	Dr. Zsolt Tibor Kosztyán

Course objectives:

Acquisition of data-driven and model-driven quantitative methodological knowledge and skills.

Course content:

Brief description of the course objective:	Objective: Students will learn about the modern quantitative methods, especially multivariate statistical methods, data reduction methods, and complex structural models integrating these methods. The aim is also for students to learn about and be able to apply basic time series analysis techniques. In addition, the aim is for students to become familiar with the basics of multifactor decision problems and benchmarking procedures.
Theoretical knowledge to be acquired:	Students will acquire the most important areas of data and model-driven quantitative methods through social and economic examples, namely: non-parametric regression, modern theory-driven and data-driven methods, modern data- and model-reduction methods, association rule mining, frequency pattern analysis, causality analysis. Modern time-series analysis



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Course content:

Practical knowledge to be acquired:	During the practice, we will apply the methods learned in theory to solve practical economic and social problems using the R programming language. In this context, students will master the basics of R programming, data structures, data quality testing, and the use of the most important statistical function libraries. During the practice, students will interpret the results obtained and learn the most important static and interactive visualization techniques.
List of the 2-4 most important mandatory literature with bibliographic data (author, title, edition data, (possibly pages), ISBN)	1. Thulin, M. (2024). Modern Statistics with R. Second edition. Chapman & Hall/CRC Press. ISBN 9781032512440. 2. Andy P. Field (2025). Discovering Using Statistics R & R Studio. SAGE. ISBN: 978-1-4462-0045-2
The teaching methods used:	Lecture: with stimulation of active and interactive student participation. Practice: individual and group tasks in computer lab and project work at home.
Assessment method:	5 degree practical grade
Assessment criteria:	The condition for signing is participation in lectures according to the conditions set out in the Study and Examination Regulations, as well as submitting the assigned assignments by the deadline and writing the closed-door paper. The practical grade is calculated from the assigned and closed-door papers. In order to achieve a satisfactory grade, at least 50% of the possible points must be achieved from the assigned and closed-door papers, and at least 60% of the possible points must be achieved together. 70 points must be achieved for an average grade, 80 points for a good grade, and 90% for an excellent grade.



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Course content:

<p>How the subject contributes to the acquisition of the competence elements specified in the KKK. Describe in the subject description how the competence elements specified in the KKK are/can be fulfilled (we do not ask for the competence elements of the KKK to be copied). knowledge:</p>	<p>knowledge:</p> <ul style="list-style-type: none">• Knows the concepts of data analysis, ethics, data security, mathematics, statistics, programming principles and relationships necessary for innovative, researcher-level cultivation of the field of data science, especially data types, representations, transformation and optimization procedures, principles of multivariate statistics, machine learning. In order to master this, he processes source studies.• Is aware of the operation of current technologies used for analysis and modeling and is able to apply them in real-world conditions, even in the case of large amounts of data. This is facilitated by the preparation of complex assignments• He/She is familiar with the data analysis, mathematical, statistical, ethical concepts, algorithmic and programming principles and relationships necessary for the innovative, research-level cultivation of the field of artificial intelligence, especially in the areas of machine learning, reinforcement learning, network modeling and data processing, statistics, uncertainty management, cognition, human cooperation, which form the basis for lifelong learning and knowledge adaptation in changing industrial environments; In order to master this, he/she processes source studies. to prepare the assignment.• He/She acquires high-level knowledge in the main application areas of artificial intelligence, such as recognition, recommendation, generation, assistance and similar systems. He/She is familiar with the problems associated with these areas and the main directions of solution options, the application limitations of related techniques; This is facilitated by interactive seminars and laboratory exercises.
<p>2026. 02. 06.</p>	<p>ability:</p> <ul style="list-style-type: none">• Able to formalize complex classification, modeling, and forecasting problems that arise in different disciplines, to determine the necessary theoretical and



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Requirements, evaluation and grading:

Exam: written + oral

The use of AI must be indicated in every submitted assignment.

Required and recommended readings:

1. Thulin, M. (2024). Modern Statistics with R. Second edition. Chapman & Hall/CRC Press. ISBN 9781032512440.
 2. Andy P. Field (2025). Discovering Using Statistics R & R Studio. SAGE. ISBN: 978-1-4462-0045-2
- Irizarry Rafael A. (2019): Introduction to Data Science: Data Analysis and Prediction Algorithms with R, ISBN: 9780367357986
- Nicholas Harkiolakis (2017): Quantitative Research Methods: From Theory To Publication, ISBN: 978-1543148138
- Jeffrey M. WOOLDRIDGE (2013): Introductory Econometrics, A modern approach. 5th Edition. ISBN-13: 978-1-111-53104-1, ISBN-10: 1-111-53104-8.

Learning outcome:

During the course, students develop their analytical and problem-solving skills. The course develops critical thinking competence through solving and analyzing class assignments.