**ADVANCED QUANTITATIVE METHODS (5 EC)**

## **Course Description**

This course teaches advanced statistical analysis whilst aiming to keep the mathematics to a minimum. Quantitative methods serve as the backbone of empirical psychology, providing the tools to uncover patterns, test hypotheses, and advance our understanding of human behaviour. This course offers a deep dive into pivotal techniques that are commonly used in psychological research, with key focus on mixed effects models, multilevel analysis, and structural equation modeling (SEM):

***Multilevel Analysis and Mixed Effects Models***

Psychological data often have a nested structure—students within classrooms, patients within clinics, or observations over time (longitudinal data). Multilevel analysis and mixed effects models provide frameworks to handle such data, enabling researchers to explore variability at different levels or times of measurement and to enhance correct inferences.

These models are commonly used when analyzing data that involve repeated measures or hierarchical structures, allowing researchers to account for both fixed and random effects. Whether studying cognitive performance in lab sessions under different conditions or responses clustered within organizational units, mixed models enhance our ability to draw nuanced conclusions.

***Structural Equation Modeling***

SEM integrates factor analysis and multiple regression, offering the tools to test complex theoretical models in applied settings. SEM can be used to validate psychological constructs and analyze longitudinal data.

Through interactive lectures and real-world datasets, this course intends to equip you with the skills to apply these advanced methods of modern statistics confidently for your thesis and throughout your future career. You will acquire some hands-on experiences to perform these analyses in the programming language R. The last week of the course will be dedicated to analysing your own data, where you can apply the newly learned techniques. If you have no data yet, alternative suitable data will be found elsewhere or simply created with simulation models. Your methods, results and conclusions will be documented in a report which will be graded.

For this course, it assumed students are familiar with basic statistical concepts and methods, such as taught in introductory statistics courses. Some experience with R is useful but not crucial as we will cover this in the first sessions. In addition to developing analytical skills, the course also puts much emphasis on producing effective and great-looking graphs.