UNIVERSITY OF WARSAW

UNIVERSITY'S INTEGRATED DEVELOPMENT PROGRAMME

Course syllabus

Course title	Advanced statistical methods and models in experimental design
Instructor(s)	Bartosz Maćkiewicz
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Affiliation	
Course format	class
Number of hours	30 hours
Number of ECTS credits	**3 ECTS credits**
Brief course description	The course assumes students have the basic knowledge of statistical analysis in empirical sciences (as well as some experience with R) and, based on it, introduces more advanced statistical methods used in cognitive research. The course provides students with hands-on experience with real data analysis using R, a cutting-edge statistical environment.
Full course description	The course assumes students have the basic knowledge of statistical analysis in behavioural sciences, including the understanding of the logic of statistical inference and the knowledge of classical statistical tests (t test, chi-square test etc.). Based on these foundations, students in this course learn statistical methods stemming from the General Linear Model (linear regression, analysis of variance) and from its extensions (e.g., logistic regression, hierarchical models). They learn how to apply those methods to experimental data, how to prepare data, if necessary, for the analysis and how to make statistical inferences in complex experimental designs. The course leans towards practice rather than theory and provides students with hands-on experience with real data analysis using R.
Learning outcomes	Knowledge: Students understand the basics of the General Linear Model and know statistical methods based on it and its generalisations (K_W03). Students know the main statistical methods used to analyse experimental data (K_W03). Abilities: Students can use the programming language of R to perform analyses of experimental data (K_U03, K_U04).

	Students are able to choose the right statistical method and use it to analyse a particular dataset (K_U04). Students can properly report results of their statistical analyses (K_U04, K_U06). Students are able to draw valid conclusions from statistical analyses they perform (K_U04).
Learning activities and teaching methods	The classes combine theoretical introductions of new material with practical exercises, involving analysing example datasets. The first 2-3 classes focus on leveling students' knowledge of statistics and R.
List of topics/classes and bibliography	List of (theoretical) topics covered in the course (without 1-to-1 correspondence with classes): - introduction to General Linear Model (GLM) - nominal predictors and contrasts - analysis of variance as a special case of GLM - complex experimental designs and interpreting interactions - GLM assumptions: checking the assumptions, violating the assumptions, data transformations, non-parametric methods as an alternative to GLM - basics of logistic regression - repeated measures data and hierarchical models - factor analysis - power analysis and effect sizes Supplementary literature: Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). Applied multiple regression/correlation analysis for the behavioral sciences. Routledge. Cumming, G. & Calin-Jageman, R. (2017). Introduction to the New Statistics: Estimation, Open Science, and Beyond. Routledge. Crawley, M. J. (2013). The R Book. Wiley.
Assessment methods and criteria	A number of assessments in which students are given a dataset and research hypotheses to verify and have to conduct an analysis and produce a report. One or two tests verifying theoretical background knowledge of the methods taught.
Attendance rules	2 unexcused absences are allowed.
Prerequisites	Students are expected to have completed at least a one semester long introductory course to statistics (in social/behavioural sciences): as a minimum they should understand the idea of statistical tests, and know and be able to correctly use t tests and the chi-square test. They are also expected to be familiar with the R environment (i.e., be able to perform statistical data analyses they already know using R) or at least to be ready to grasp its basics within the very first weeks of the course (the latter

	option entails, practically speaking, experience with at least one programming language other than R).
Academic honesty	Students must respect the principles of academic integrity. Cheating and plagiarism (including copying work from other students, internet or other sources) are serious violations that are punishable and instructors are required to report all cases to the administration.
Remarks	Any remarks you would like students to know