

COURSE SYLLABUS

EXPERIMENTAL RESEARCH METHODS CORE COURSE

- Instructor:** József Fiser, Professor
Department of Cognitive Science
Central European University
- Term:** Fall, 2022/23
- Course level:** PhD (2 credits for grade)
- Pre-requisites:** basic linear algebra, basic probability
- E-learning site:** <http://ceulearning.ceu.hu/>
- Time and place:** Thursday 13:30 – 15:10 Dept. CogSci QS, Room C-503

Course Description

This course will cover the basic topics of Experimental Statistics and Research Methods for Behavioral Sciences. It will consist of two parts, frequentist and Bayesian statistics. The frequentist part comprises the subjects of scales, descriptive statistics, frequentist inferential statistics including independent and repeated measure t-tests, one- and two-way ANOVAs, effect sizes, correlational and regression analysis, and selected nonparametric methods. In the second part, the basics of Bayesian statistics will be introduced and contrasted with frequentist statistics. The course will also survey the good practices of designing, conducting, analyzing, interpreting, and communicating scientific psychological research. Students will use SPSS, R, Python or other programs in their assignments for statistical analysis.

Learning Outcomes

- Being able to plan and design an experimental study
- Understanding why and when you need frequentist or Bayesian statistics
- Knowing enough to evaluate appropriateness of use of statistics in Results sections of research papers
- Being able to select and perform correct statistics for your own data

Course Requirements

The final grade will be determined roughly by the following weighting:

- Exam (to be conducted on the week following the end semester): 75%
- Assigned study reports, class activity: 25%

Required Materials:

- Gravetter, F. J., & Wallnau, L. B. (2009). *Statistics for the Behavioral Sciences (8th ed.)*. Belmont: Wadsworth. (G&W)
- Provided pdfs

COURSE SCHEDULE

Week	Date	Topic/Reading done <i>before</i> class	Assignment Due	Homework Due
1	Sept. 22	Scales, Frequency Distributions, Central Tendency, Variability, Normalization, G&W Chapters 1-5	Review Appendix A; do learning checks, pre & post exams	HW1: Chapter 1-5 homework problems Pre & post exam times & scores
2	Sept. 29	Probability and Samples G&W Ch. 6-7		HW 2: Chapter 6-7 homework problems
3	Oct. 6	Hypothesis testing, Effect size, Power G&W Ch. 8	Select/explore your Stat SW	HW 3: Chapter 8 homework problems
4	Oct. 13	t test G&W Ch. 9-11		HW 4: Chapter 9-11 homework problems
5	Oct. 20	ANOVA G&W Ch. 13-15	SPSS: Assignment #1	HW 5: Chapter 13-15 homework problems
6	Oct. 27	Non-parametric statistics G&W Ch. 18-20		HW 6: Chapter 18-20 homework problems
7	Nov. 3	Estimation, Correlation, Regression G&W Ch. 12, 16-17	SPSS: Assignment #2	HW 7: Chapter 12, 16-17 homework problems
8	Nov. 10	What is wrong with NHST? Lindsay 1975; Loftus 1996; Gigerenzer 2004; Kline 2004		HW 8: Summary 1-page
9	Nov. 17	What is the difference between NHST and Bayesian statistics? Dienes 2011; Wetzels 2011; Morey 2015	SPSS: Assignment #3	HW 9: Summary 1-page
10	Nov. 24	What is Bayesian Data Analysis? Kruschke 2009; Kruschke 2011		HW 10: Summary 1-page
11	Dec. 1	How to compute Bayesian Statistics? Rouder 2009; Rouder 2012; Rouder 2013	SPSS: Assignment #4	HW 11: Summary 1-page
12	Dec. 8	How to do good science? Rouder 2016; Wagenmakers 2007; Marsman 2017; Munafo 2017		HW 12: Summary 1-page
	Dec. 15		FINAL EXAM— 11:00-14:00	