

# Statistical methods in natural sciences (VT 2022)

**Location:** XXX (unclear at this stage) at EBC.

**Course text book:** Quinn, G.P. and Keough M.J. 2002. *Experimental design and data analysis for biologists*. Cambridge. This very good, classic and general book (although examples are biological) is required reading, and should be purchased, borrowed or otherwise be made available, well ahead of time by everyone taking the course.

I note that the course book is also available in electronic format (as a PDF).

**Note 1:** The course **assumes** that you have a basic understanding of statistical estimation and inference (make sure to **read chapters 1-3** in the course text book!).

**Note 2:** Although the course is planned as an on-campus event, parts of the course may run remotely via Zoom - practical details later.

**Teachers:** Göran Arnqvist (Goran.Arnqvist@ebc.uu.se). Responsible for the practicals is a TA.

Date	Time	Topic	Reading <sup>1</sup>
Tue 25/1	13.00 -15.30	<b>Course start</b> - information and introduction. <b>L1:</b> Statistical inference, power analysis and experimental design. Introduction to practical I. Brief introduction to statistical software (at the end).	Pp 32-44; 155-172; A.
Thu 27/1	12.00 -13.00 <sup>2</sup>	<i>R support/workshop</i>	
Thu 27/1	13.00 -15.30	<b>L1</b> continued and <b>L2:</b> Meta-analysis. Presentation of practical I.	Pp 50-51; A.
Tue 1/2	13.00 -15.30	<b>L3:</b> Linear regression and multiple regression analysis.	Pp 72-99; 111-142.
Thu 3/2	13.00 -15.30	<b>L4:</b> One-way analysis of variance and F-tests, transformations of data.	Pp 58-68; 173-207.
Tue 8/2	13.00 -15.30	<b>L5:</b> More complex linear models: nested, factorial, randomized blocks and repeated measures designs.	Pp 208-254; 262-273; 301-315.
Thu 10/2	13.00 -15.00	<b>L6:</b> Analysis of covariance. Introduction to practical II.	Pp 339-352.
Tue 15/2	12.00 -13.00 <sup>2</sup>	<i>R support/workshop</i>	
Tue 15/2	13.00 -15.30	Presentation of practical II.	
Thu 17/2	13.00 -15.30	<b>L7:</b> Generalized linear models, including logistic regression and linear models with Poisson and binomial errors. Introduction to practical III.	Pp 359-372.
Tue 1/3	12.00 -13.00 <sup>2</sup>	<i>R support/workshop</i>	
Tue 1/3	13.00 -15.30	Presentation of practical III.	
Thu 3/3	13.00 -15.30	<b>L8:</b> Resampling and randomization techniques; $\chi^2$ based analyses of frequencies. Introduction to practical IV.	Pp 25-26; 45.
Tue 8/3	12.00 -13.00 <sup>2</sup>	<i>R support/workshop</i>	
Tue 8/3	13.00 -15.30	<b>L9:</b> Multivariate methods I: Principal Component Analysis, Discriminant Function Analysis and Manova. Presentation of practical IV.	Pp 401-417; 425-458.
Thu 10/3	13.00 -15.30	<b>L10:</b> Multivariate methods II: multivariate classification and ordination techniques. Introduction to practical V.	Pp 459-493.
Tue 15/3	12.00 -13.00 <sup>2</sup>	<i>R support/workshop</i>	
Tue 15/3	13.00 -15.30	Presentation of practical V.	
Thu 17/3	13.00 -15.30	<b>L11:</b> Other current topics in statistics (morphometrics, Bayesian inference, mcmc estimation)	A
Tue 22/3	13.00 -15.30	Final literature discussion - discuss book and solve/discuss a series of hand-out questions.	

<sup>1</sup> Page numbers refer to the course text book; A = refers to separate material that will be distributed by email.

<sup>2</sup> Non-mandatory **R** support session, for those that want and/or need some help to make progress with the practicals in R.