lmat1375

2023

Biometry

4.00 credits	22.5 h + 22.5 h	Q2

⚠ **This learning unit is not being organized during this academic year.**

Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	LBIO1282 and LBIO1283
Main themes	Linear model (LM) + notion of interaction; Generalized linear model (GLM Poisson & Binomial); Mixed model and notions of fixed and random factors; Model selection (AIC); Multiple comparisons; Statistical power and overfitting
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 The student shall understand, and become able to use correctly and critically the principal methods for the statistical analysis of biological and environmental univariate data. He perceives the relationship between experimental design and analysis model and the necessity of planning experiments, and becomes familiar with computer-aided data analysis. After completing this course, the student should master the basic methods for the analysis of univariate data, be able to choose the analysis model and method adapted to the design of simple factorial experiments, to analyse and interpret correctly the results of such experiments. He should be able to progress by himself and follow fruitfully advanced lectures on experimental design and data analysis. **Upon completion of this learning, the student will be able to :** **With respect to understanding statistics:** - Make a critical analysis choice according to the question asked and the type of data available, and justify this choice - Explain in French the general principle of a hypothesis test, and the meaning of a p-value - Interpret in French the results of a statistical test - Write and interpret the equation of a statistical model - Interpret confidence intervals for parameters, models* (conditional mean), predictions - State the conditions of application of a statistical test and demonstrate the ability to verify them -Select the appropriate type of graph to summarize a data set / statistical model **With respect to the use of R software :** **From a detailed list of functions and/or solved examples :** - Perform a (G)LM(M) type analysis, obtain the coefficients associated with the model, and test the significance of each of the variables - Check the conditions of application of a statistical model - Create a summary graph of a data set and/or a statistical model - Obtain a confidence interval for the conditional mean / a prediction interval
Evaluation methods	Open-book written exam for theoretical comprehension of concepts, and open-book practical exam with computer-based R software for the realization and interpretation of statistical analyzes on real datasets.
Teaching methods	Audience course and practical work in a computer room. The student is encouraged to interactivity for all these activities.
Content	With this course, the student acquires the basic notions and principles of probabilities and statistical inference necessary for the scientific process. At the end of the learning phase, they are able to determine the important characteristics of an experimental design, to select and carry out the appropriate statistical analysis for the analysis of the data, and to interpret the results and possible limitations to the conclusions to be drawn. The course begins with the basics of probability theory. It then details the principles of statistical inference (population vs sample, variables and distributions, sources of variations in the data, hypothesis testing,

p-value and type I and II error, confidence interval ...). The main types of basic statistical analysis are detailed and illustrated: t test, ANOVA (1, 2 and 3), correlation and simple linear regression, count data (X^2). The principles of permutation tests are also discussed.

The course is complemented by practical work on computer using the software R, which allow the student to carry out in practice all the statistical analyzes discussed.

Inline resources	Course slides and materials for practical work are available on Moodle.
Other infos	A basic knowledge of the R software is required: the student is expected to be able to create and modify R-data sets independently. The course LBIO1282 aims specifically to give the student this knowledge; if he has not followed it beforehand, the student must be trained autonomously in these skills, eg by means of the many resources available online for free.
Faculty or entity in charge	BIOL