


Teacher(s)	De Laender Frederik ;Schtickzelle Nicolas ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	In order to successfully follow this course, you should be acquainted with the concept of Probability and the rules of Probability calculus, the bases of statistical inference, the principles and practice of the classical methods for statistical analysis of continuous data (Regression, Analysis of Variance) and of discrete data (Contingency tables, Goodness of fit tests), and the use of a statistical software for applying the above.
Main themes	Taking into account the most frequently encountered needs of researchers in Biology, as well as the time constraints, the course offers of two main modules : Linear Modeling, and Methods of Multivariate Analysis. The examples presented are mainly drawn from researches in Ecology.
Learning outcomes	<p>At the end of this learning unit, the student is able to :</p> <p>The objectives are that, as a result of successfully attending this course, the students :</p> <ul style="list-style-type: none"> - Are aware of the necessity of planning any scientific experiment before it is started. - Have practiced, in the frame of a personal scientific question, the principles of experimental design. - Are able to review, choose, and apply knowingly the best adapted methods for modeling and analysing data from their domain of expertise in Biology. <p>1</p> <ul style="list-style-type: none"> - Are able to set up a scientific experiment, to manage the data generated by this experiment, to analyse them (usually with the help of a computer software), and to interpret critically the results. - Have shown their ability to report a scientific experiment in a written document and through an oral communication. These reports may be elaborated in groups of two or three students.
Evaluation methods	<p>The two modules will be evaluated separately, each module contributing 10/20 to the final score. As the final score must be an integer number, the sum of the two notes will be rounded up if both modules are passed (at least 5/10) and down if it is not the case.</p> <p><i>Module 1 (Linear statistical modelling) :</i></p> <p>Open book exam, including two exercises on LMM and GLM(M) on R (based on practical sessions and first seminar) and one case study (based on second seminar).</p> <p><i>Module 2 (Multivariate data analysis) :</i></p> <p>Open book written exam consisting of multiple choice questions, open questions and practical solution of exercises with R software on a computer. The exam is carried out on Moodle, in a computer room on campus, unless health regulations require that the exam be taken at a distance.</p>
Teaching methods	<p>Lectures, seminars, and exercise sessions in a computer room. The student is encouraged to interactivity for all these activities.</p> <p>Exercises : learn to solve a statistical problem. Find the appropriate analysis when faced with a problem, check the application conditions relating to the use of this analysis, perform the statistical test on the R software, interpret the results obtained and illustrate them.</p>
Content	<p>Module 1 : <i>Linear statistical modeling</i></p> <p>Theoretical introduction into mixed and generalized models (6h); Practical sessions on R (14h); Two case studies on mixed and generalized models (4h+2h).</p> <p>Module 2 : <i>Multivariate data exploration</i></p> <p>This module details how to visualize and check multivariate data, how to summarize and combine a set of continuous variables into a lower number of variables through PCA (Principal Component Analysis), how to perform the PCA equivalent for categorical data(FCA, Factorial Correspondence Analysis), and how to unravel the links between two sets of continuous variables (Canonical Correlation Analysis). The teaching philosophy insists on the fact that statistics are tools and that the key skills the student should acquire is the expertise to choose the right tool for the job, how to parameterize it and interpret its results critically. Real examples from ecology will be used to illustrate clean but also more difficult cases, closer to real life.</p>
Inline resources	All resources are available on the Moodle website: visuals of the lectures and practical sessions, data sets and R scripts, links to additional resources and supporting books.

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 and perform basic data management and statistical analysis procedures. If such knowledge is not acquired, the student must be trained autonomously in these skills, e.g. by means of the many resources available online for free.
Faculty or entity in charge	BIOL

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biology of Organisms and Ecology	BOE2M	5		
Master [60] in Biology	BIOL2M1	5		