LBOE2112

2014-2015

Analyse des données biologiques

5.0 credits	24.0 h + 36.0 h	1q

Teacher(s) :	SOMEBODY ; El Ghouch Anouar ;
Language :	Français
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.
Aims :	The objectives are that, as a result of successfully attending this course, the students : ' 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. ' 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 interprete 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. *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Teaching methods :	The students should choose the theme of their personal project quite early (October) and should have an approval of the theme by one of the teachers, before starting to work on it. A preliminary report of the project (scientific frame, question, structure of the experiment and of the data, methodology for the analysis) should be deposited on either iCampus or WebCampus, not later than the first Monday following February 15th. It should follow the same format as the final report, and should include: A title, the scientific frame, the scientific questions, a table of contents, the structure of the experiment, of the data, a description of the chosen analysis methodology and a justification of this choice (these latter points may evolve later), and, if applicable, the composition of the group. The written report will consist of a 5 pages (one author) to 7 pages (2 - 3 authors) document, that should be printed in 2 copies and delivered to the professors at the time of the oral examination. The examination consists of an oral presentation of the report by the author(s). The maximal duration of the presentation is 15 minutes, with a "Power Point" support of maximum 8 slides for a single author, or 20 minutes, with a PP support of maximum 10 slides, for a group of authors. Bring your slide presentations converted to PDF format, on an USB chip. Recommendations: The report and oral presentation should comprise the following elements - that will be part of the evaluation criteria: The scientific context, the scientific questions, the hypotheses to be tested (if any), the structure of the experiment and of the data (files), the chosen analysis methodology, and arguments justifying that choice; presentation - and illustrations!!! - of the results of the analysis, interpretation, critical discussion; pertinent bibliographic references.
Content :	Module 1 : Linear Statistical Modeling Factorial experiments: Responses, factors, structure of an experiment, combinations of factors, factorial vs observational approaches, bases of experimental design. Reminder of classical Linear Models: Quantitative vs qualitative factors, Fixed vs Random choice of levels, Design Matrix, Parameters. Introduction to Mixed Linear Models and to Generalized Linear Models. Some particular questions: Why repeat? How to treat "messy" data? Module 2 : Multivariate Analysis Correlation matrices, diagonalizing a covariance/correlation matrix, eigen values and vectors, Principal Components Analysis Canonical Analysis, Discriminant Analysis, Cluster Analysis, Introduction to Correspondence Analysis; Tools for interpreting the results. Module 3 : Personal Project The students shall realize a personal project, alone or in groups of two or (maximum) three students. The project is a scientific experiment, preferrably realized by the students themselves, ideally related to their MS thesis. The report of this project is one of the main bases for the evaluation of the student's performance: see "Teaching methods and Evaluation rules", below. The students should choose the theme of their personal project quite early (October) and should have an approval of the theme by one of the teachers, before starting to work on it.

Other infos :	The course consists of 24 hours of lectures and 36 hours of practicals, among which 12 hours are devoted to modules 1 and 2, 21 hours are for the personal project, and 3 hours are devoted to a questions/answers session. The detailed calendar is posted on the sites iCampus / webCampus.
	The evaluation process aims at measuring how the students have acquired the knowledge and capacities enumerated in the objectives of the course. It is based upon an oral presentation, and upon two types of reports that the students have to produce:
	' On one hand, a report of each of the practicals. These reports will be evaluated by the assistants: they will indicate, during the practicals, the detailed modalities and the deadlines for the current year.
	' On the other hand, a written report of the personal project, see details in the Module 3, above.
	' Finally, an oral presentation of the personal project, to be presented during the examination. See details in the Module 3, above. This presentation will be followed by a series of questions, that are not limited to the only points and methods exposed in the personal project!
	The evaluation takes into account: (1) the reports of the Practicals; (2) the Personal Project (presentation, report, answers to the questions).
	The final note is the average of the notes for the reports of the Practicals, and of the notes for the Personal Project, except in case one of these two notes is inferior or equal to 8/20; in the latter case, the final note is the lowest of the two.
	Students are strongly encouraged, to present the examination during the June session, in order to take advantage of their research activities during the second semester of the Academic year.
	A three-hours revision session will be organized in April 2012. The students whose preliminary report poses problems, will be personally asked to participate to that session.
Cycle and year of study :	> Master [60] in Biology > Master [120] in Biology of Organisms and Ecology
Faculty or entity in charge:	BIOL